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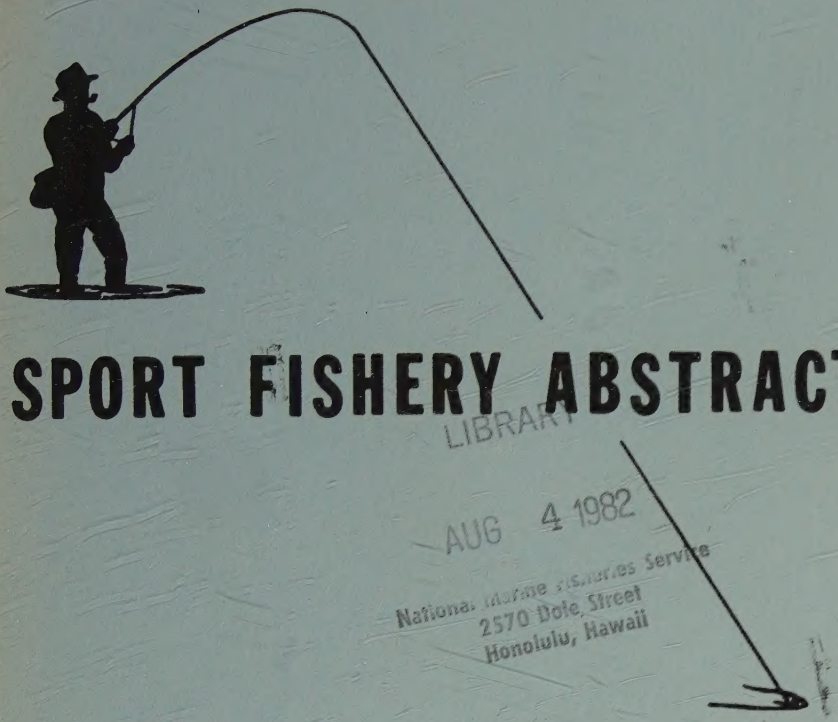

SPORT FISHERY ABSTRACTS

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SPORT FISHERY ABSTRACTS

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Sport Fishery Abstracts is intended to furnish fishery biologists with abstracts of current literature in sport fishery research and management.

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SPORT FISHERY ABSTRACTS

An abstracting service for fishery research and management

Volume 27 Number 2 1982

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GENERAL FISH CULTURE

82-000503 Boyd, C. E. WATER QUALITY MANAGEMENT FOR POND FISH CULTURE. *Elsevier Sci. Publ. Co., N.Y.* xi + 318p. 1981. Available @ $69.75 from Elsevier Sci. Publ. Co., 52 Vanderbelt Ave., New York, NY 10017. SFA 27(2)

82-000504 Cange, S.; M. Miltner and J. W. Avault, Jr. RANGE PELLETS AS SUPPLEMENTAL CRAYFISH FEED. *Prog. Fish-Cult.* 44(1):23-24. Jan. 1982. SFA 27(2)
[Sch. For. Wildl. Manage., La. State Univ., Baton Rouge 70803]

82-000505 Carr, B. A. THE CULTURE AND BEHAVIOR OF SELECTED ESTUARINE FISH AND SHELLFISH IN AQUARIA RECEIVING EFFLUENT WATER FROM A POWER PLANT. *Ph.D. dissertation, Tex. A&M Univ.* 245p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(9):3512. Mar. 1982. SFA 27(2)

82-000506 Chakroff,M. S. AQUACULTURE EXTENSION SERVICES CASE STUDIES. *FAO Fish. Circ.* No. 740. v + 27p. Nov. 1981. SFA 27(2)
[FAO, Rome, Italy]

82-000507 Freeze, M. and S. Henderson. THE AQUACULTURE INDUSTRY OF ARKANSAS IN 1979. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:115-126. 1980[1981]. SFA 27(2)
[Ark. Game Fish Comm., Little Rock 72205]

82-000508 Hynes, J. D.; E. H. Brown, Jr.; J. H. Helle; N. Ryman and D. A. Webster. GUIDELINES FOR THE CULTURE OF FISH STOCKS FOR RESOURCE MANAGEMENT. *Can. J. Fish. Aquatic Sci.* 38(12):1867-1876. Dec. 1981. In English with French summ. SFA 27(2)
[Minist. Nat. Resour., Fish. Br., Toronto, ON M7A 1W3, Canada]

82-000509 Kahan, D.; G. Uhlig; D. Schwenzer and L. Horowitz. A SIMPLE METHOD FOR CULTIVATING HARPACTICOID COPEPODS AND OFFERING THEM TO FISH LARVAE. *Aquaculture* 26(3-4):303-310. Jan. 1982. SFA 27(2)
[Dep. Zool., Hebrew Univ. Jerusalem, Jerusalem, Israel] Harpacticoid copepods were made more available to fish larvae by transfering them to mesh-bottomed floating trays. The mesh pore size, 80-100µm, allowed only the smaller stages (nauplii) to fall through and be preyed upon by first-day feeders of *Sparus aurata*. Preliminary experiments, using a mesh pore size of 36-45µm, were carried out in order to find out whether these trays could also serve as a culturing site. Densities obtained were 37-100 copepods/ml for *Schizopera elatensis*, *Tisbe holothuriae* and *Tisbe* sp. Propsects of using this method for culturing and offering desired developmental stages of copepods to fish larvae are discussed.

82-000510 Katoh, J. A CASE FOR FISHERIES ENGINEERING AND ITS APPLICATION TO THE PLANNING OF COASTAL AQUACULTURE FACILITIES IN JAPAN. *Aquacult. Eng.* 1(1):35-44. Jan. 1982. SFA 27(2)

GENERAL FISH CULTURE (CONTINUED)

82-000510 CONTINUED
[Lab. Environ. Hydraul. Eng., Dep. Mar. Environ. Sci. Technol., Tokyo Univ. Fish., 5-7 Konan-4, Minato-ku, Tokyo 108, Japan] Fisheries engineering concerns the development of the fisheries industry. It has not yet been systematized because the problems raised are so diverse and it is not easy to provide an organic link between the biological and engineering sectors. This paper is intended to present a definition and the significance or characteristics of fisheries engineering and to propose a methodology for it. The gist of this paper is: (1) the aim of fisheries engineering is to build up the environmental conditions for the forms of marine life concerned and (2) the six basic points which are derived serve as principles which should be applied to any kind of problem.

82-000511 Kinghorn, B. P. CENTRAL SYSTEM FOR MONITORING THE QUALITY OF WATER FROM MANY SOURCES. *Prog. Fish-Cult.* 44(1):30-32. Jan. 1982. SFA 27(2)
[Res. Stn. Salmonids, 6600 Sunndalsøra, Norway]

82-000512 Lam, T. J. APPLICATIONS OF ENDOCRINOLOGY TO FISH CULTURE. *Can. J. Fish. Aquatic Sci.* 39(1):111-137. Jan. 1982. In English with French summ. SFA 27(2)
[Dep. Zool., Natl. Univ. Singapore, Singapore]

82-000513 Lam, T. J. FISH CULTURE IN SOUTHEAST ASIA. *Can. J. Fish. Aquatic Sci.* 39(1):138-142. Jan. 1982. In English with French summ. SFA 27(2)
[Dep. Zool., Natl. Univ. Singapore, Singapore]

82-000514 Larkin, P. A. AQUACULTURE IN NORTH AMERICA: AN ASSESSMENT OF FUTURE PROSPECTS. *Can. J. Fish. Aquatic Sci.* 39(1):151-154. Jan. 1982. In English with French summ. SFA 27(2)
[Inst. Anim. Resour. Ecol., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

TROUT AND SALMON CULTURE

82-000515 Billard, R. and M. Richard. INHIBITION OF SPERMATOGENESIS AND VITELLOGENESIS IN RAINBOW TROUT BY HORMONAL ADDITIVES IN THE DIET. *Prog. Fish-Cult.* 44(1):15-18. Jan. 1982. SFA 27(2)
[Lab. Fish. Physiol., Natl. Inst. Agron. Res., 78350 Jouy en Josas, France]

82-000516 Crone, R. A. POTENTIAL FOR PRODUCTION OF COHO SALMON *(ONCORHYNCHUS KISUTCH)* IN LAKES WITH OUTLET BARRIER FALLS, SOUTHEASTERN ALASKA. *Ph.D. dissertation, Univ. Mich.* 405p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(9):3507. Mar. 1982. SFA 27(2)
Three salmon-free lakes in southeastern Alaska, located above waterfalls that are barriers to upstream movement of fish, were stocked with young-of-the-year coho salmon (*Oncorhynchus kisutch*) to determine potential of such lakes to produce emigrant smolts. Two lakes were fishless; the third and largest contained Dolly Varden (*Salvelinus malma*). Coho fry were stocked at a density of 8,571/ha in 1.4-ha, shallow Tranquil Lake, whereas, in 15.3-ha Ludvik and 95.4-ha Osprey lakes, both deep and with steeply sloping bottoms, the rates were 6,677 and 2,893/ha, respectively.

TROUT AND SALMON CULTURE (CONTINUED)

82-000516 CONTINUED Initially the young salmon grew rapidly while feeding almost exclusively on large-sized, indigenous zooplankters, including those found in the limnetic zone. As a result, macrozooplankter populations were decimated in only 2 to 8 weeks. The coho then switched to feeding on benthos and small-sized zooplankton, and slowed sharply in their growth. Only in Osprey did the initial period of rapid growth continue long enough (8 weeks) so that the great majority of coho exceeded the threshold size for smolting in the first growing season. Here, 91% of the smolts were age I at emigration and only 9% were age II. In contrast, in Tranquil these values were respectively 66 and 34%, and in heavily stocked Ludvik 46% left at age I, 6% at age II, 32% at age III, and 16% at age IV. Survival to emigration (age-I plus age-II smolts) totalled 57,7, and 58%, respectively, of the fry stocked in Tranquil, Ludvik, and Osprey. In Ludvik, through age IV, it doubled to 14%. Efficiency of production (percentage fo coho biomass produced in a lake that became the desired yield as spring emigrants) was high in Tranquil and Osprey (respectively, 86 and 73%). In Ludvik, efficiency was only 11% after 2 years and 30% after 4. The number of adults returning from age-I and age-II smolts equalled, respectively, 396 and 106/ha of lake surface for Tranquil, and 147 and 12/ha for Osprey. For Ludvik, annual adult yields from age-I through age-IV emigrants ranged from 2 to 30/ha. Adult returns totalled 6, 1, and 6% respectively, of the fry stocked in Tranquil, Ludvik, and Osprey. It is concluded that by stocking at conservative rates and at proper times, barriered lakes in southeastern Alaska (including those with Dolly Varden) have rewarding potential for rearing coho fry to smolts, with the ultimate result of increasing the number of harvestable adults.

82-000517 Helle, J. H. SIGNIFICANCE OF THE STOCK CONCEPT IN ARTIFICIAL PROPAGATION OF SALMONIDS IN ALASKA. *Can. J. Fish. Aquatic Sci.* 38(12):1665-1671. Dec. 1981. In English with French summ. SFA 27(2)
[NMFS, P.O. Box 155, Auke Bay, AK 99821]

82-000518 Mork, O. I. GROWTH OF THREE SALMOID SPECIES IN MONO AND DOUBLE CULTURE (*SALMO SALAR* L., *S. TRUTTA* L. AND *S. GAIRDNERI* RICH.). *Aquaculture* 27(2):141-147. Mar. 1982. SFA 27(2)
[Fiskerisjefen; Møre og Romsdal, Nedre Strandgt. 4, Boks 252, 6001 Ålesund, Norway] Juvenile Atlantic salmon, sea trout and rainbow trout were used in an experiment in which two species in each tank were compared with controls of each species separately. Specific growth rate was best in the experimental groups where the two species were reared together. The theory was developed that social facilitation or moderate interaction could cause the better growth. No starvation as a result of competition was discovered in any group.

82-000519 Raisanen, G. R. and D. J. Behmer. REARING LAKE WHITEFISH TO FINGERLING SIZE. *Prog. Fish-Cult.* 44(1):33-36. Jan. 1982. SFA 27(2)
[Biol. Chem. Dep., Lake Superior State Coll., Sault Ste. Marie, MI 49783]

82-000520 Sandercock, F. K., (chairman). PROCEEDINGS OF THE THIRTY-FIRST ANNUAL NORTHWEST FISH CULTURE CONFERENCE. *Proc. Northwest Fish Cult. Conf.* 31:1-241. 1980(1981). SFA 27(2)
A collection of papers.--RS

82-000521 Schreck, C. B. and L. G. Fowler. GROWTH AND REPRODUCTIVE DEVELOPMENT IN FALL CHINOOK SALMON: EFFECTS OF SEX HORMONES AND THEIR ANTAGONISTS. *Aquaculture* 26(3-4):253-263. Jan. 1982. SFA 27(2)
[Oreg. Coop. Fish. Res. Unit, Oreg. State Univ., Corvallis 97331]

TROUT AND SALMON CULTURE (CONTINUED)

82-000522 Weatherley, A. H. and H. S. Gill. INFLUENCE OF BOVINE GROWTH HORMONE ON THE GROWTH DYNAMICS OF MOSAIC MUSCLE IN RELATION TO SOMATIC GROWTH OF RAINBOW TROUT, *SALMO GAIRDNERI* RICHARDSON. *J. Fish Biol.* 20(2):165-172. Feb. 1982. SFA 27(2)

[Life Sci. Div., Scarborough Coll., Univ. Toronto, West Hill, ON M1C 1A4, Canada] Bovine growth hormone (bGH), administered intramuscularly at 20 μg^{-1} every 2 weeks, produced faster somatic growth in rainbow trout fingerlings to approximately 20 cm than in those not receiving the hormone. Both groups were maintained at 12°C, with a photoperiod of 16:8 LD, and on *ad libitum* rations daily. The faster growth was characterized by a controlled increase in input of fibres into the mosaic muscle (which dominates the body tissues by its bulk). It is not known if the enhanced input of fibres is an example of the known ability of the mosaic fibre mass to respond with flexibility and precision to widely differing somatic growth rates, or is a specific consequence of the growth hormone. In other fingerling trout receiving 4-5% daily rations and consequently growing slowly, bGH did not stimulate growth or evidently modify fibre input dynamics. Body dry weight, and condition (*K*), though modified by rations and growth rate, evidently had little effect on muscle fibre growth.

WARMWATER CULTURE

82-000523 Barash, H.; I. Plavnik and R. Moav. INTEGRATION OF DUCK AND FISH FARMING: EXPERIMENTAL RESULTS. *Aquaculture* 27(2):129-140. Mar. 1982. SFA 27(2)

[Agric. Res. Organ., Inst. Anim. Sci., Volcani Cent., Bet Dagan, Israel] In 1977 and 1978, two fish ponds at the Dor Aquaculture Experiment Station were integrated with duck production. Each pond's area was 400 m^2 and they were stocked with a polyculture of common carp, Tilapia, silver carp and grass carp (White Amur). The ducks were fed with prepared, nutritionally balanced feed, while the fish had to get by with the ducks' droppings plus the feed dropped directly from the ducks' beaks into the ponds. The ducks' performance on the ponds was superior to their 'land' control in growth rate, feed efficiency, viability and cleanness of feathers and skin. The average daily gain of the fish was 38.5 kg ha^{-1}, not significantly different from ponds receiving similar mixtures of dry poultry manure plus supplementary feeds. Our experimental results provide necessary empirical support to the conclusion that the system is very efficient and its use should be expanded in warm water aquaculture.

82-000524 Bondari, K. CAGE PERFORMANCE AND QUALITY COMPARISONS OF TILAPIA AND DIVERGENTLY SELECTED CHANNEL CATFISH. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:88-98. 1980[1981]. SFA 27(2)

[Dep. Entomol. Fish., Coastal Plain Exp. Stn., Univ. Ga., Tifton 31793] Six groups of cage-grown channel catfish (*Ictalurus punctatus*) and *Tilapia aurea* were compared for body weight, total length, condition factor, carcass characteristics, and sensory quality. Catfish used in this study were the first generation progeny of brood catfish selected for increased and decreased body weight and for body weight variability at 48-week post-spawning age. A random-bred control line and a group of pond-raised catfish were also included in the experiment. Results indicated that 1 generation of divergent selection has increased body weight and body weight variability in the upward lines but no declines were observed in the downward lines. Selection for improved growth rate may also produce catfish more uniform in size. In the taste test tilapia were preferred over catfish.

82-000525 Crawford, T. G. and J. K. Beadles. INTENSIVE CULTURE OF WHITE AMUR IN CAGES. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:99-107. 1980[1981]. SFA 27(2)

WARMWATER CULTURE (CONTINUED)

82-000525 CONTINUED
[Dep. Biol. Sci., Ark. State Univ., State University 72467] From 3 May 1979 through 9 November 1979, cage culturing of fingerling white amur, *Ctenopharyngodon idella* was conducted utilizing alfalfa pellets, catfish pellets, alfalfa and bermuda grass hay or aquatic vegetation as feeds. Feed utilizations, feed conversion ratios and growth rates were analyzed. Feed conversion rations ranged from 10:1 to 30:1. Fish fed the catfish pellets or hay yielded poor growth. Those fed the alfalfa pellets were larger and achieved the expected stocker size. Mortality was a problem throughout the study period. Handling stress, agonistic behavior, and bacterial and fungal infections appeared to have been the causative agents.

82-000526 Epler, P.; K. Dieniarz and E. Marosz. THE EFFECT OF LOW DOSES OF CARP HYPOPHYSIAL HOMOGENATE AND SOME STEROID HORMONES ON CARP (*CYPRINUS CARPIO* L.) OOCYTE MATURATION IN VITRO. *Aquaculture* 26(3-4):245-251. Jan. 1982. SFA 27(2)
[Acad. Agric., Dep. Ichthyol. Fish., Krakow-Mydlniki, Rybacka Stacja Doświadczalna, Poland] Studies on the in vitro incubation of carp oocytes have shown that low doses (10.0-50.0µg/ml of medium) of carp hypophysial homogenate (c.h.h.) do not induce complete maturation. Steroid hormones at 1µg/ml used alone stimulate only a percentage of oocytes to reach full maturation. Low doses of carp hypophysial homogenate (added to the culture at the beginning of incubation) and steroid hormones (added 6h later) induce maturation in over 40% of oocytes. The highest percentage of mature oocytes was obtained in the cultures to which were added carp hypophysial homogenate at 30-40µg/ml of medium and 17α-hydroxy-20β-dihydroprogesterone (17α20βP) (1µg/ml of medium) 6h later. The results are discussed in connection with their application in artificial spawning of carp.

82-000527 Henderson-Arzapalo, A. and R. R. Stickney. EFFECTS OF STOCKING DENSITY ON TWO TILAPIA SPECIES RAISED IN AN INTENSIVE CULTURE SYSTEM. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:379-387. 1980[1981]. SFA 27(2)
[Dep. Wildl. Fish. Sci., Tex. A&M Univ., College Station 77843] *Tilapia aurea* and *T. mossambica* fry were stocked in a flowing system at varying stocking densities (5, 10, 20, 30, 40, 50 and 60 fish/tank in 60 liters of water) in an intensive tank culture system. The fish were maintanied for 115 days on commercial pelleted feed. In terms of length increase, weight gain, condition, total yield, and food conversion rates, *T. aurea* performed significantly better than *T. mossambica* at all stocking densities. The *T. mossambica* experienced much higher mortality and reduced growth due to an auto-immune reaction related to stocking density, which effectively limits the density at which this species can be stocked. Hypersensitivity reactions began when the biomass reached about 20g/liter with a turnover time of one-half hour, although further research is needed to completely quantify their crowding tolerance limits. *T. aurea* were still growing and feeding vigorously at termination of the experiment (with a maximum biomass of 66.2g/liter) and probably could have continued to grow to even greater biomass. *T. aurea* is preferable to *T. mossambica* in intensive fish culture or in tilapia polyculture due to the former's higher yields and greater resistance to crowding.

82-000528 Hulata, G.; R. Moav and G. Wohlfarth. EFFECTS OF CROWDING AND AVAILABILITY OF FOOD ON GROWTH RATE OF FRY IN THE EUROPEAN AND CHINESE RACES OF THE COMMON CARP. *J. Fish Biol.* 20(3):323-327. Mar. 1982. SFA 27(2)
[Agric. Res. Organ., Inst. Anim. Sci., Fish. Aquacult. Res. Stn., Dor. D.N. Hoff Hacarmel 30820, Israel] Fry of the European and Chinese races of the common carp and interracial crossbred fry were grown together in a series of ponds for 28 days after hatching. The degree of crowding and the amount of available natural food were intentionally varied in these experimental ponds. This resulted in a large variation in mean growth between ponds, ranging from

WARMWATER CULTURE (CONTINUED)

82-000528 CONTINUED 0.1 to 5.2g per fish during the 28 days growth period. Under conditions of very slow growth, resulting from severe crowding and lack of natural food, fry of the Chinese carp grew several times faster than European carp. At lower densities and when natural food was more abundant, resulting in a faster rate of growth, this difference between the two races disappeared. Crossbred fry between the Chinese and European carp grew faster than either of their parents under all conditions tested.

82-000529 Koops, H. and H. Kuhlmann. GRADING OF FARMED EELS BY MEANS OF MESHWIRE BOXES. *Aquacult. Eng.* 1(1):11-21. Jan. 1982. SFA 27(2)
[Inst. Küsten-Binnenfisch. Bundesforschungsanst. Fisch., Hamburg, West Germany] This paper described the successful grading of farmed eels using square meshed box screens. The grading curves for yellow and silver eels are evaluated for the square mesh sizes: 10, 16, 20 and 25mm while some indication is given to the location of the sexes within these gradings.

82-000530 Lin, H.-R. POLYCULTURAL SYSTEM OF FRESHWATER FISH IN CHINA. *Can. J. Fish. Aquatic Sci.* 39(1):143-150. Jan. 1982. In English with French summ. SFA 27(2)
[Dep. Biol., Zhongshan (Sun Yatsen) Univ., Guangzhou, China]

82-000531 Lone, K. P. and A. J. Matty. THE EFFECT OF FEEDING 11-KETOTESTOSTERONE ON THE FOOD CONVERSION EFFICIENCY AND TISSUE PROTEIN AND NUCLEIC ACID CONTENTS OF JUVENILE CARP, *CYPRINUS CARPIO* L. *J. Fish Biol.* 20(1):93-104. Jan. 1982. SFA 27(2)
[Dep. Biol. Sci., Univ. Aston in Birmingham, Birmingham B4 7ET, England]

82-000532 Meriwether, F. II. INDUCTION OF POLYPLOIDY IN ISRAELI CARP. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:275-279. 1980[1981]. SFA 27(2)
[Dep. Fish. Allied Aquacult., Auburn Univ., Auburn, AL 36849] Israeli carp (*Cyprinus carpio*) eggs were cold-shocked after fertilization at various temperature regimes and durations. Nine months later their blood was sampled for analysis. Stained erythrocyte nuclei were measured with an ocular micrometer to calculate mean relative areas. Polyploidy appeared to have been induced in each cold-shock group, but no group appeared to consist entirely of polyploids. Gonadal examination showed no apparent differences between the control group and the cold-shocked groups.

82-000533 Msiska, O. V. REARING OF THE FRY OF THE AFRICAN CATFISH, *CLARIAS LAZERA* (C&V) USING LIVE AND ARTIFICAL FEEDSTUFFS. *Bamidgeh* 33(4):122-127. Dec. 1981. SFA 27(2)
[Fish. Dep., P.O. Box 44, Domasi, Malawi] An experiment was conducted to rear the fry of the African catfish, *Clarias lazera* (C.&V.) in aquaria using trout starter or chicken feed supplemented during the first two weeks with either *A. salina* nauplii or zooplankton in a live, frozen or freeze-dried form. It showed that feeding with live natural organisms during the first period was essential, both *Artemia* and zooplankton giving acceptable results, processing of the organisms decreased the food value significantly ($P < 0.05$). Trout starter gave better results ($P < 0.001$) as a staple food than did the chicken mash, but the latter also held perspective.

82-000534 Ram, N. M.; O. Zur and Y. Avnimelech. MICROBIAL CHANGES OCCURRING AT THE SEDIMENT-WATER INTERFACE IN AN INTENSIVELY STOCKED AND FED FISH POND. *Aquaculture* 27(1):63-72. Feb. 1982. SFA 27(2)
[Dep. Civ. Eng., Univ. Mass., Amherst 01003]

WARMWATER CULTURE (CONTINUED)

82-000535 Reagan, R. E., Jr. SURVEY OF CURRENT PRACTICES AND PROBLEMS IN THE MISSISSIPPI CATFISH INDUSTRY. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:127-130. 1980[1981]. SFA 27(2)
[Dep. Wildl. Fish., Miss. State Univ., Mississippi State 39762]

82-000536 Rothbard, S. INDUCED REPRODUCTION IN CULTIVATED CYPRINIDS - THE COMMON CARP AND THE GROUP OF CHINESE CARPS: 1. THE TECHNIQUE OF INDUCTION, SPAWNING AND HATCHING. *Bamidgeh* 33(4):103-121. Dec. 1981. SFA 27(2)
[Fish Aquacult. Stn., Dor, Israel]

82-000537 Sutton, R. J. and W. M. Lewis. FURTHER OBSERVATIONS ON A FISH PRODUCTION SYSTEM THAT INCORPORATES HYDROPONICALLY GROWN PLANTS. *Prog. Fish-Cult.* 44(1):55-59. Jan. 1982. SFA 27(2)
[Environ. Res. Technol., Inc., 1716 Heath Parkway, Fort Collins, CO 80524]

82-000538 Van Gorder, S. D. and J. D. Fritch. FILTRATION TECHNIQUES FOR SMALL-SCALE AQUACULTURE IN A CLOSED SYSTEM. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:59-66. 1980[1981]. SFA 27(2)
[Rodale Press, Inc., Organic Garden. Farm. Res. Cent., Kutztown, PA 19530] Recirculating 2271-liter culture systems were designed and evaluated as potential fish production units. System components include a culture tank, sedimentation basin, and a biological filter. Three different biological filter types were compared: a commercially available plastic filter media, a rotating biodisc filter, and a submerged gravel filter. Each duplicated system was stocked with 5 cm fingerling channel catfish, *Ictalurus punctatus*, which were fed daily. The experiment continued until maximum loading capacities were attained. In the 155 day growing period, the greatest standing crop attained was 41.2kg using the rotating biodisc filter. Excepting one replication which exhibited 100 percent mortality due to an aerator failure, survival rate was 95 percent or greater, with feed conversions ranging from 1.27 to 1.62.

MARICULTURE

82-000539 Fuchs, J. PRODUCTION DE JUVENILES DE SOLE (*SOLEA SOLEA*) EN CONDITIONS INTENSIVES. I. LE PREMIER MOIS D'ELEVAGE. [THE PRODUCTION OF JUVENILE SOLE (*SOLEA SOLEA*) UNDER INTENSIVE CONDITIONS. I. THE FIRST MONTH OF REARING.] *Aquaculture* 26(3-4):321-337. Jan. 1982. In French with English summ. SFA 27(2)
[France Aquacult., c/o Soc. Itticolt. Meridion., Via Wagner, 10 Palermo, Italy] Trials with soles of age 0 to 1 month carried out in 1977 and 1978 are described. The aim was to improve and simplify the rearing method proposed by Girin (1978). The quantity of alevins produced was about 15000 to 20000 per 2-m^3 tank and survival and growth were comparable with the best results obtained thus far in small volumes (70-80% for survival, 50-80 mg for average weight). Precise quantification of conditions of feeding (quality and quantity), rearing conditions and environmental factors (aeration, photoperiod, type and shape of the tanks) for larvae (0-15 days) and juveniles (15-30 days) allow us to consider the rearing of this species to be well controllable up to the end of the first month. On the basis of the results it is possible to envisage the extension of this rearing method to the production of many hundreds of thousands of individuals without the strict conditions of the laboratory.

82-000540 Hope, S. J. HOLDING ATLANTIC MENHADEN IN A CLOSED SYSTEM FOR ENVIRONMENTAL RESEARCH. *Prog. Fish-Cult.* 44(1):50-52. Jan. 1982. SFA 27(2)
[Stone and Webster Eng. Corp., 245 Summer St., Boston, MA 02107]

MARICULTURE (CONTINUED)

82-000541 Poxton, M. G.; K. R. Murray and B. T. Linfoot. THE GROWTH OF TURBOT (*SCOPHTHALMUS MAXIMUS* (L.)) IN RECIRCULATING SYSTEMS. *Aquacult. Eng.* 1(1):23-34. Jan. 1982. SFA 27(2)

[Dep. Brewing Biol. Sci., Heriot-Watt Univ., Chambers St., Edinburgh, EH1 1HX, Scotland] O-group wild turbot (*Scophthalmus maximus* (L.)) were used in a number of feeding experiments designed to assess the usefulness of readily available species of industrial fish as feed for the ongrowing stage of cultivation (10-500g). Sprats (*Sprattus sprattus* (L.)) and sandeels (*Ammodytes marinus* Raitt) were the most successful in that feeding rates of 2% live weight per feed gave conversion efficiencies which were generally better than 3:1. A regular regime of two feeds a day should give growth rates approaching 2% per day resulting in an ongrowing period of about 200 days at 16°C. The turbot were maintained in closed recirculating systems using a simple design for the treatment units. These provided a stable environment in which to conduct the experiments the average water quality conditions being given. There were few health problems and the taste and texture of the fish produced appeared to be good.

FEEDS, FEEDING, AND NUTRITION

82-000542 Dabrowski, K.; K. Krasnicki and H. Kozlowska. RAPESEED MEAL IN THE DIET FOR COMMON CARP REARED IN HEATED WATERS. III. METAL CONCENTRATIONS IN TISSUES. *J. Anim. Physiol. Anim. Nutr.* 46(5):273-282. 1981. In English with German summ. SFA 27(2)

[Inst. Ichthyobiol. Fish., Acad. Agric. Technol., 10-957 Olsytyn-Kortowo, Poland]

82-000543 Evenson, E. J. and K. C. Kruse. EFFECTS OF A DIET OF BULLFROG LARVAE ON THE GROWTH OF LARGEMOUTH BASS. *Prog. Fish-Cult.* 44(1):44-46. Jan. 1982. SFA 27(2)

[N.J. Dep. Environ. Prot., Div. Water Resour., P.O. Box CN-029, Trenton 08625]

82-000544 Foltz, J. W.; J. M. Gibson and J. T. Windell. EVALUATION OF TILAPIA MEAL FOR FISH DIETS. *Prog. Fish-Cult.* 44(1):8-11. Jan. 1982. SFA 27(2)

[Dep. Entomol. Fish. Wildl., Clemson Univ., Clemson, SC 29631]

82-000545 Fuchs, J. PRODUCTION DE JUVENILES DE SOLE (*SOLEA SOLEA*) EN CONDITIONS INTENSIVES. II. TECHNIQUES DE SEVRAGE ENTRE 1 ET 3 MOIS. [THE PRODUCTION OF JUVENILE SOLE (*SOLEA SOLEA*) UNDER INTENSIVE CONDITIONS. II. METHODS OF WEANING BETWEEN 1 AND 3 MONTHS.] *Aquaculture* 26(3-4):339-358. Jan. 1982. In French with English summ. SFA 27(2)

[France Aquacult., c/o Soc. Itticolt. Meridion., Via Wagner, 10 Palermo, Italy] Weaning Dover sole fry on inert feed remains the main difficulty in the culture of this species. Starting from the rearing method proposed by Girin (1978), the results were improved and the volume of the tanks was increased. In 2-m^3 fiberglass tanks, the survival of fry weaned to frozen natural feed (Artemia, polychaetes and bivalves) at the age of 25 days reached 70% at the age of 90 days (50% from hatching) with an average weight of 0.8g; with a dry pellet offered after the age of 30 days, survival did not exceed 40% at the age of 90 days (25% from hatching) but the average weight reached 1.4g. Moist diets, based on bivalve and fish flesh, were also successfully tested. In the figerglass tanks used, the density at the age of 25 days could be increased between 1000 and 1500 fry/m^2, providing productions of 300-5000 weaned 90-days-old juvenile fish per 2-m^3 tanks.

FEEDS, FEEDING, AND NUTRITION (CONTINUED)

82-000546 Gatesoupe, F.-J. and J. H. Robin. THE DIETARY VALUE FOR SEA-BASS LARVAE (*DICENTRARCHUS LABRAX*) OF THE ROTIFER *BRACHIONUS PLICATILIS* FED WITH OR WITHOUT A LABORATORY-CULTURED ALGA. *Aquaculture* 27(2):121-127. Mar. 1982. SFA 27(2)
[Inst. Nat. Rech. Agron., Cent. Rech. Hydrobiol., Lab. Nutr. Poissons, Saint-Pée-sur-Nivelle, 64310 Ascain, France]

82-000547 Gatesoupe, F.-J. and P. Luquet. WEANING OF THE SOLE (*SOLEA SOLEA*) BEFORE METAMORPHOSIS. *Aquaculture* 26(3-4):359-368. Jan. 1982. SFA 27(2)
[INRA, Cent. Rech. Hydrobiol., Lab. Nutr. Poissons, Saint-Pee-sur-Nivelle 64310 Ascain, France] Sole larvae were given live *Artemia* nauplii only during their first few days of life. They were then fed on artificial diet, semi-moist and crumbly in form. Good results were obtained without supply of frozen nauplii (15 and 28% survivors from hatching up to day 70, respectively for two lots abruptly weaned from day 10 or 11, with 50 and 90mg as the final mean weight, and a supply of 1980 or 2660 live nauplii per 70-day-old fish). Gradual weaning was also tried, supplying frozen nauplii for the first 5 days of inert feeding. The best weaning was also found to be the latter one, i.e. with frozen nauplii being given from day 11 to day 15. This produced 49% survivors from hatching up to day 50. A total of 2800 live nauplii was required per sole at this stage. But the growth rate, 27 mg as the mean weight by day 50, was unsatisfactory. In addition, the pigmentation of sole from the three tested batches of eggs was observed. The proportion of normally pigmented sole at the end of the experiments was between 13 and 70%. The differences between lots from the same spawning were found to be significant. This would indicate that unchecked rearing conditions might produce the very high level of pigmentary anomalies generally observed in the rearing of flatfish.

82-000548 Gatlin, D. M. III and R. R. Stickney. FALL-WINTER GROWTH OF YOUNG CHANNEL CATFISH IN RESPONSE TO QUANTITY AND SOURCE OF DIETARY LIPID. *Trans. Am. Fish. Soc.* 111(1):90-93. Jan. 1982. SFA 27(2)
[Dep. Biochem., Miss. State Univ., Mississippi State 39759]

82-000549 Ina, K.; Ohsuga, H. and Y. Suzuki. [EFFECT OF PLANT PROTEIN ON GROWTH OF RED SEA BREAM, *CHRYSOPHRYS MAJOR.*] *Bull. Jpn. Soc. Sci. Fish.* 47(10):1351-1354. Oct. 1981. In Japanese with English summ. SFA 27(2)
[Dep. Agric. Chem., Fac. Agric., Shizuoka Univ., 836, Ohya, Shizuoka 420, Japan]

82-000550 Jackson, A. J.; B. S. Capper and A. J. Matty. EVALUATION OF SOME PLANT PROTEINS IN COMPLETE DIETS FOR THE TILAPIA *SAROTHERODON MOSSAMBICUS*. *Aquaculture* 27(2):97-109. Mar. 1982. SFA 27(2)
[Dunstaffnage Mar. Res. Lab., P.O. Box 3, Oban, Argyll, Scotland]

82-000551 Jauncey, K. THE EFFECTS OF VARYING DIETARY PROTEIN LEVEL ON THE GROWTH, FOOD CONVERSION, PROTEIN UTILIZATION AND BODY COMPOSITION OF JUVENILE TILAPIAS (*SAROTHERODON MOSSAMBICUS*). *Aquaculture* 27(1):43-54. Feb. 1982. SFA 27(2)
[Inst. Aquacult., Univ. Stirling, Stirling FK9 4LA, Scotland] The effects of varying dietary protein level on several nutritional parameters of *Sarotherodon mossambicus* were studied. Eight approximately isoenergetic diets were formulated with protein levels ranging from 0% to 56% in increments of 8%. A zero protein diet was included so that true digestibility, Net Protein Utilization (NPU) and Biological Values (BV) were determined. Specific growth rates (%/day) were: 40% protein (3.85) > 48% protein (3.49), 56% protein (3.51) > 32% protein (3.04), 24% protein

FEEDS, FEEDING, AND NUTRITION (CONTINUED)

82-000551 CONTINUED (3.10) > 16% protein (2.46) > 8% protein (1.32) > 0% protein (-0.16). Food conversion decreased with increasing dietary protein levels, although not significantly above 40%. Protein efficiency ratio, NPU and BV all decreased with increasing dietary protein level whilst carcass analysis and protein digestibility were little affected. The minimum dietary protein level producing maximum growth of *S. mossambicus* was found to be 40%, with a dietary protein to energy ratio (P : E) of 116.6 mg protein per kilocalorie of calculated metabolizable energy.

82-000552 Knox, D.; C. B. Cowey and J. W. Adron. EFFECTS OF DIETARY COPPER AND COPPER: ZINC RATIO ON RAINBOW TROUT *SALMO GAIRDNERI*. *Aquaculture* 27(2):111-119. Mar. 1982. SFA 27(2)
[Inst. Mar. Biochem., St. Fittick's Rd., Torry, Aberdeen AB1 3RA, Scotland]

82-000553 Marian, M. P.; A. G. Ponniah; R. Pitchairaj and M. Narayanan. EFFECT OF FEEDING FREQUENCY ON SURFACING ACTIVITY AND GROWTH IN THE AIR-BREATHING FISH, *HETEROPNEUSTES FOSSILIS*. *Aquaculture* 26(3-4):237-244. Jan. 1982. SFA 27(2)
[Sch. Biol. Sci., Madurai Kamaraj Univ., Madurai 625 021, India] Juveniles of *Heteropneustes fossilis* (4.5±0.35g) were fed twice a day, once a day, once in 2 days, once in 3 days, once in 7 days or had no food at all for a total period of 21 days. Food consumption by the group fed once in 2 days was the greatest (327 gcal/meal); the level of consumption per meal was around 240 gcal in the remaining groups. With increasing feeding frequency, the overall feeding rate incrased to 65 gcal/g live weight per day in the group fed twice a day. Growth rate was the highest (8.7 gcal/g per day) in the groups fed twice and once in a day, moderate (3.4 gcal/g per day) in that fed once in 2 days and zero or negative in that fed once in 3 days, and in other groups the individuals had negative growth. Growth efficiency was highest (17%) in the group fed twice a day, which surfaced more frequently than the remaining groups. From the points of both feeding and conversion efficiency, feeding once a day in cultures of juvenile *H. fossilis* is recommended.

82-000554 Mathias, J. A.; J. Martin; M. Yurkowski; J. G. I. Lark; M. Papst and J. L. Tabachek. HARVEST AND NUTRITIONAL QUALITY OF *GAMMARUS LACUSTRIS* FOR TROUT CULTURE. *Trans. Am. Fish. Soc.* 111(1):83-89. Jan. 1982. SFA 27(2)
[Dep. Fish. Oceans, Freshwater Inst., 501 University Crescent, Winnipeg, MB R3T 2N6, Canada]

82-000555 Murai, T.; H. Ogata and T. Nose. METHIONINE COATED WITH VARIOUS MATERIALS SUPPLEMENTED TO SOYBEAN MEAL DIET FOR FINGERLING CARP *CYPRINUS CARPIO* AND CHANNEL CATFISH *ICTALURUS PUNCTATUS*. *Bull. Jpn. Soc. Sci. Fish.* 48(1):85-88. Jan. 1982. SFA 27(2)
[Div. Fish. Nutr., Natl. Res. Inst. Aquacult., Hiruta, Tamaki, Watarai, Mie 519-04, Japan]

82-000556 Pigott, G. M. THE ROLE OF A FOOD ENGINEER IN FISH DIET RESEARCH AND FORMULA DEVELOPMENT. *Aquacult. Eng.* 1(1):71-79. Jan. 1982. SFA 27(2)
[Inst. Food Sci. Technol,, Univ. Wash., Coll. Fish., Seattle 98195]

82-000557 Robinette, H. R.; M. W. Brunson and E. J. Day. USE OF DUCKWEED IN DIETS OF CHANNEL CATFISH. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:108-114. 1980[1981]. SFA 27(2)
[Dep. Wildl. Fish., Miss. State Univ., Mississippi State 39762] Duckweed (Family Lemnaceae) was incorporated into 6 isocaloric diets which were fed for 10 weeks to channel catfish (*Ictalurus punctatus*) fingerlings in

FEEDS, FEEDING, AND NUTRITION (CONTINUED)

82-000557 CONTINUED aquaria. Three diets contained surplus essential amino acids while utilizing duckweed at 0, 15, and 20 percent of the diet. Three other diets had the same levels of duckweed, but contained borderline levels of amino acids. No significant difference in mean weight gain per fish was found within each group of 3 diets. Feed conversion and kcal of energy required per *g* of weight gain were not statistically different for the fish fed the 6 diets.

82-000558 Snow, J. R.; T. A. Al-Ahmad and J. E. Parsons. ROTIFERS AS A PRODUCTION DIET FOR STRIPED BASS FINGERLINGS. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:280-291. 1980[1981]. SFA 27(2)

[Dep. Fish. Allied Aquacult., Auburn Univ., Auburn, AL 36849] Growth of striped bass *Morone saxatilis* fry on a diet of rotifers were studied in the laboratory and in the field. Although the rate of growth was slower when rotifers were the principal food than when other acceptable zooplankton were eaten, rotifers were judged to be acceptable as a starting diet. This was based upon the fact that survival was higher and more consistent from pond to pond than was the case when mixed zooplankton was the source of food initially. Trichlorfon as Mesoten ® was used in rearing ponds to reduce predaceous and competitive invertebrates and to favor development of the rotifer population.

82-000559 Soebiantoro, B. REPLACEMENT OF BRINE SHRIMP NAUPLII WITH ARTIFICAL DIETS FOR FEEDING STRIPED BASS LARVAE. *Ph.D. dissertation, Auburn Univ.* 90p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(8):3045. Feb. 1982. SFA 27(2)

Results from the study indicate that striped bass fry can utilize a properly prepared dry diet after 4 to 10 days of priming on live brine shrimp, depending on the quality of the newly-hatched larvae. Palatability and physical properties of the dry diet were satisfactory as indicated by the relatively high incidence of feeding by fry fed these diets. The factor in brine shrimp nauplii which promotes growth of larval fish is not heat stable.--From abstr.

82-000560 Viola, S.; S. Mokady; U. Rappaport and Y. Arieli. PARTIAL AND COMPLETE REPLACEMENT OF FISHMEAL BY SOYBEAN MEAL IN FEEDS FOR INTENSIVE CULTURE OF CARP. *Aquaculture* 26(3-4):223-236. Jan. 1982. SFA 27(2)

[Miloubar Cent. Feedmill, D.N. Asherat, Israel] Feeding experiments with carp were performed in plastic tanks, in cages and in experimental ponds, using pelleted rations of 25% total crude protein. Fishmeal was the only source of supplemental protein in the control ration, besides the basal ground grains. Partial replacement (40% of the fishmeal) by soybean meal in pond trials required only supplements of methionine and 5% oil in order to attain the same growth, protein and energy utilisation as with the control ration. When most or all of the fishmeal was replaced by soybean meal, supplements of methionine, 0.4-0.5% lysine and 10% oil were necessary to achieve gains, protein efficiency ratio (PER), net protein utilization (NPU), protein retentions and energy retentions equal to those of the control fishmeal ration. It was concluded that regular soybean meal contains 10-15% less available energy and 10-15% less available lysine for carp than the generally accepted values (as in NRC-NAS, Nutrient Requirements of Poultry, 1977).

82-000561 Watanabe, T.; M. Wada; T. Takeuchi and S. Arai. [ABSENCE OF INTERCONVERSION OF TOCOPHEROLS IN RAINBOW TROUT.] *Bull. Jpn. Soc. Sci. Fish.* 47(11):1455-1462. Nov. 1981. SFA 27(2)

[Lab. Fish. Nutr., Tokyo Univ. Fish., Konan-4, Minato, Tokyo 108, Japan]

FEEDS, FEEDING, AND NUTRITION (CONTINUED)

82-000562 Watanabe, T.; T. Takeuchi and M. Wada. DIETARY LIPID LEVELS AND α-TOCOPHEROL REQUIREMENT OF CARP. *Bull. Jpn. Soc. Sci. Fish.* 47(12):1585-1590. Dec. 1981. SFA 27(2)
[Lab. Fish Nutr., Tokyo Univ. Fish., Konan-4, Minato, Tokyo 108, Japan]

82-000563 Watanabe, T.; T. Takeuchi; M. Wada and R. Uehara. THE RELATIONSHIP BETWEEN DIETARY LIPID LEVELS AND α-TOCOPHEROL REQUIREMENT OF RAINBOW TROUT. *Bull. Jpn. Soc. Sci. Fish.* 47(11);1463-1471. Nov. 1981. SFA 27(2)
[Lab. Fish. Nutr., Tokyo Univ. Fish., Konan-4, Minato, Tokyo 108, Japan]

82-000564 Willis, D. S. and S. A. Flickinger. COMMON CARP EGGS AS A STARTER DIET FOR THE INTENSIVE CULTURE OF SMALLMOUTH BASS FRY. *Prog. Fish-Cult.* 44(1):28-29. Jan. 1982. SFA 27(2)
[Kans. Fish Game Comm., Winfield State Bank Bldg., Winfield 67156]

TRANSPORTING FISH

82-000565 Barton, B. A. and R. E. Peter. PLASMA CORTISOL STRESS RESPONSE IN FINGERLING RAINBOW TROUT, *SALMO GAIRDNERI* RICHARDSON, TO VARIOUS TRANSPORT CONDITIONS, ANAESTHESIA, AND COLD SHOCK. *J. Fish Biol.* 20(1):39-51. Jan. 1982. SFA 27(2)
[Fish. Br., Minist. Nat. Resour., Queen's Park, Toronto, ON M7A 1W3, Canada] Plasma cortisol levels of fingerling rainbow trout were measured as an index of the stress resulting from various procedures used for transport of the fish for stocking. When transported under 'normal' conditions, which included water at the hatchery acclimation temperature (10-11°C), O_2 saturation or supersaturation, and neutral pH, there was a marked increase in plasma cortisol levels within 0.5h, which was maintained over the next 4h of transport; there was a significant decrease in plasma cortisol by 8h of transport. It was found that the plasma cortisol levels at 4 and 8h were not appreciably altered by transport under partial O_2 desaturation, O_2 saturation, O_2 supersaturation, or 0.5% NaCl, or by anaesthesia with tricaine methanesulfonate (MS 222) prior to capture and transport in MS 222-free water or 0.5% NaCl. A 15 min exposure to an immobilizing dose of buffered or unbuffered MS 222, or 2-phenoxyethanol, caused an increase in plasma cortisol of about 2h duration, indicating that anaesthetics are themselves stressful. Exposure to chilled water (1°C) caused a large increase in plasma cortisol levels by 4h after initiation of exposure; plasma cortisol had decreased at 1 day, and by 2 days a constant level was reached which was above the level in fingerling trout under 'normal' hatchery conditions. Trout acclimated to chilled water for 24h and transported in chilled water had an increase in plasma cortisol during transport. Anaesthesia prior to transport or addition of salt did not reduce the stress of transport as judged by plasma cortisol levels. The results indicate that stress from capture and transport during stocking cannot be avoided using present methods.

82-000566 Bower, C. E. and D. T. Turner. AMMONIA REMOVAL BY CLINOPTILOLITE IN THE TRANSPORT OF ORNAMENTAL FRESHWATER FISHES. *Prog. Fish-Cult.* 44(1):19-23. Jan. 1982. SFA 27(2)
[Sea Res. Found. Inst. Aquarium Stud., P.O. Box 7-495, West Hartford, CT 06107

TRANSPORTING FISH (CONTINUED)

82-000567 Johnson, D. L. and M. T. Metcalf. CAUSES AND CONTROLS OF FRESHWATER DRUM MORTALITY DURING TRANSPORTATION. *Trans. Am. Fish. Soc.* 111(1):58-62. Jan. 1982. SFA 27(2)
[Div. Fish. Wildl. Manage., Ohio State Univ., Columbus 43210]

MISCELLANEOUS CULTURE TECHNIQUES AND EQUIPMENT

82-000568 Carignan, R. AN EMPIRICAL MODEL TO ESTIMATE THE RELATIVE IMPORTANCE OF ROOTS IN PHOSPHORUS UPTAKE BY AQUATIC MACROPHYTES. *Can. J. Fish. Aquatic Sci.* 39(2):243-247. Feb. 1982. In English with French summ. SFA 27(2)
[Natl. Water Res. Inst., Can. Cent. Inland Waters, P.O. Box 5050, Burlington, ON L7R 4A6, Canada]

82-000569 Chervinski, J. and S. Rothbard. AN AID IN MANUALLY SEXING *TILAPIA*. *Aquaculture* 26(3-4):389. Jan. 1982. SFA 27(2)
[Fish. Aquacult. Res. Stn., Dor, D.N. Hof-Hacarmel, 30820, Israel]

82-000570 Donaldson, E. M. and G. A. Hunter. SEX CONTROL IN FISH WITH PARTICULAR REFERENCE TO SALMONIDS. *Can. J. Fish. Aquatic Sci.* 39(1):99-110. Jan. 1982. In English with French summ. SFA 27(2)
[West Vancouver Lab., Resour. Serv. Br., Dep. Fish. Oceans, 4160 Marine Dr., West Vancouver, BC V7V 1N6, Canada]

82-000571 Kinghorn, B. P. WATER FLOW CONTROLLER. *Prog. Fish-Cult.* 44(1):48-49. Jan. 1982. SFA 27(2)
[Res. Stn. Salmonids, 6600 Sunndalsøra, Norway]

82-000572 Meriwether, F. H. II and W. L. Shelton. OBSERVATION ON AQUARIUM SPAWNING OF ESTROGEN-TREATED AND UNTREATED TILAPIA. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:81-87. 1980[1981]. SFA 27(2)
[Ala. Coop. Fish Res. Unit, Auburn Univ., Auburn, AL 36849]

82-000573 Wisely, B.; J. E. Holliday and R. E. MacDonald. HEATING AN AQUACULTURE POND WITH A SOLAR POOL BLANKET. *Aquaculture* 26(3-4):385-387. Jan. 1982. SFA 27(2)
[New South Wales, Fish Res. Stn., Salamander Bay, N.S.W. 2301, Australia] A floatig solar blanket of laminated bubble plastic was used to heat a 0.11 ha seawater pond of 1.3m depth. The covered pond maintained daily temperatures 6 to 9°C above two controls. Local air temperatures averaged 14 to 19°C. Oysters, prawns, seasquirts, and fish in the covered pond all survived. After three weeks, the blanket separated. This was the result of pond temperatures exceeding 30°C, the maximum manufacturer's specification. Floating blankets fabricated to higher specifications would be useful for maintaining above-ambient temperatures in small ponds or tanks in temporary situations during cold winter months and might have a more permanent use.

82-000574 Withler, F. C. CRYOPRESERVATION OF SPERMATOZOA OF SOME FRESHWATER FISHES CULTURED IN SOUTH AND SOUTHEAST ASIA. *Aquaculture* 26(3-4):395-398. Jan. 1982. SFA 27(2)
[Dep. Fish. Oceans, Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada] The activity and fertilizing ability of spermatozoa of Indian carp *Labeo rohita*, common carp *Cyprinus carpio*, tawes carp *Puntius gonionotus*,

MISCELLANEOUS CULTURE TECHNIQUES AND EQUIPMENT (CONTINUED)

82-000574 CONTINUED grass carp *Ctenopharyngodon idella*, bighead carp *Aristichthys nobilis*, and the catfish *Pangasius sutchi* were tested after freezing and storage in liquid nitrogen. Spermatozoa of Indian, common, tawes, and bighead carps were activited successfully after periods up to 26 days. Activated Indian carp semen fertilized ova as effectively as fresh semen. Preserved semen of *P. sutchi* produced a gel and could not be used effectively in fertilizing ova.

GENERAL LIMNOLOGY AND OCEANOGRAPHY

82-000575 Lindsey, C. C.; K. Patalas; R. A. Bodaly and C. P. Archibald. GLACIATION AND THE PHYSICAL, CHEMICAL AND BIOLOGICAL LIMNOLOGY OF YUKON LAKES. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 966. vi + 37p. May 1981. In English with French summ. SFA 27(2)
[Dep. Fish. Oceans, Winnipeg, MB R3T 2N6, Canada]

82-000576 Sartoris, J. J.; J. F. LaBounty; S. G. Campbell and J. R. Boehmke. LIMNOLOGY OF THE UPPER NORTH PLATTE RESERVOIR SYSTEM, WYOMING. *U.S. Dep. Interior Bur. Reclam.* REC-ERC-81-10. v + 129p. July 1981. SFA 27(2)
[Bur. Reclam., Appl. Sci. Br., Div. Res., Eng. Res. Cent., Denver, CO]

82-000577 Thompson, R. GENERAL CHARACTERISTICS OF SPRINGS IN NEVADA AND UTAH. *Proc. Desert Fishes Counc.* 12:49-52. 1980(1981). SFA 27(2)
[HDR Sci., 804 Anacapa St., Santa Barbara, CA 93101]

82-000578 Youger, J. D. RESULTS OF A TROPHIC CLASSIFICATION OF OHIO LAKES. *Ohio J. Sci.* 82(2):90. 1982. Abstract only. SFA 27(2)
[Ohio Environ. Prot. Agency, 361 E. Broad St., Columbus 43215]

CHEMICAL LIMNOLOGY AND OCEANOGRAPHY

82-000579 Tarapchak, S. J.; S. M. Bigelow and C. Rubitschun. OVERESTIMATION OF ORTHOPHOSPHORUS CONCENTRATIONS IN SURFACE WATERS OF SOUTHERN LAKE MICHIGAN: EFFECTS OF ACID AND AMMONIUM MOLYBDATE. *Can. J. Fish. Aquatic Sci.* 39(2):296-304. Feb. 1982. In English with French summ. SFA 27(2)
[NMFS, 2200 Washtenaw Ave., Ann Arbor, MI 48104]

BENTHOS

82-000580 Cooper, S. D. and C. R. Goldman. ENVIRONMENTAL FACTORS AFFECTING PREDATION RATES OF *MYSIS RELICTA*. *Can. J. Fish. Aquatic Sci.* 39(1):203-208. Jan. 1982. In English with French summ. SFA 27(2)
[Dep. Biol. Sci., Univ. Calif., Santa Barbara 93106]

BENTHOS (CONTINUED)

82-000581 Hale, M. M. and D. R. Bayne. EFFECTS OF WATER LEVEL FLUCTUATIONS ON THE LITTORAL MACROINVERTEBRATES OF WEST POINT RESERVOIR. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:175-180. 1980[1981]. SFA 27(2)
[Fish. Res. Lab., Fla. Game Fresh Water Fish Comm., Eustis 32726]

82-000582 Landye, J. J. THE CONSERVATION OF MOLLUSKS IN MEXICO AND THE U.S.A. *Proc. Desert Fishes Counc.* 12:98-99. 1980(1981). In English and Spanish. Abstract only. SFA 27(2)
[BIO-GEO Southwest, Inc., 3465 N. Jamison Blvd., Flagstaff, AZ 86001]

82-000583 Mills, E. L.; K. Pittman and B. Munroe. EFFECT OF PRESERVATION ON THE WEIGHT OF MARINE BENTHIC INVERTEBRATES. *Can. J. Fish. Aquatic Sci.* 39(1):221-224. Jan. 1982. In English with French summ. SFA 27(2)
[Dep. Oceanogr., Dalhousie Univ., Halifax, NS B3H 4J1, Canada]

PLANKTON

82-000584 Harper, D. M. and A. J. D. Ferguson. ZOOPLANKTON AND THEIR RELATIONSHIPS WITH WATER QUALITY AND FISHERIES. *Hydrobiologia* 88(1-2):135-145. 26 Mar. 1982. SFA 27(2)
[Dep. Adult Educ., Univ. Leicester, Leicester, England]

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[Wildl. Fish. Biol., Univ. Calif., Davis 95616] The striped mullet, *Mugil cephalus*, endures pronounced diurnal and seasonal temperature changes in

PHYSIOLOGY (CONTINUED)

82-000647 CONTINUED the shallow bay system of the Texas coast. The mullet responds to its temperature-induced changes in metabolic oxygen demand with a pattern of respiratory, ventilatory, and hematological adjustments. These variables were measured at 14.5° and 28.5°C during each season to separate seasonal from short-term responses. In van Dam-type respirometers, oxygen consumption rates remained at essentially constant levels at each temperature through the year ($\bar{x}$ = 42.84 ml O_2/kg/h at 14.5°C and 141.83 ml O_2/kg/h at 28.5°C). Gill ventilatory flows, frequencies and stroke volumes also reamined seasonally constant at each temperature. Seasonal differences at each temperature regime were most evident in the blood characteristics of hemoglobin concentration and hematocrit. While both juvenile and adult fish display increases in response to the energy demands imposed by warmed environments, seasonal peaks of hemoglobin and hematocrit (autumn Hb = 8.24g%, Hc = 32%) occurred as waters cooled when the adults migrated to the Gulf of Mexico for spawning. This pattern should enhance the ecological fitness of a spawning adult striped mullet by increasing its capacity for aerobic swimming performance during the migration, thereby decreasing mortality by predation.

82-000648 Charlon, N. and J. M. Blanc. ETUDE DES CIVELLES D'*ANGUILLA ANGUILLA* L. DANS LA RÉGION DU BASSIN DE L'ADOUR. 1. CARACTÉRISTIQUES BIOMÉTRIQUES DE LONGUEUR ET DE POIDS EN FONCTION DE LA PIGMENTATION. [A STUDY OF THE ELVERS (*ANGUILLA ANGUILLA* L.) IN THE ADOUR BASIN AREA. 1. LENGTH AND WEIGHT BIOMETRICAL CHARACTERISTICS IN FUNCTION OF PIGMENTATION.] *Arch. Hydrobiol.* 93(2):238-255. 1982. In French with English summ. SFA 27(2)

[Cent. Rech. Hydrobiol., B.P. 3, Saint-Pée-sur-Nivelle, 64310 Ascain, France] Two types of elver populations have been studied from October 1979 to August 1980 by periodical samplings along the seaside on one hand, and in the river on the other hand. The biometrical characteristics are given in function of the time of the year and of the stage of pigmentation. It appears that the decrease in length and weight in the course of time, regarded by some authors as a second metamorphosis, is only due to differences in biometrical characteristics of the successive populations arriving along the French coast all the year round.

82-000649 Cichra, C. E.; W. H. Neill and R. L. Noble. DIFFERENTIAL RESISTANCE OF NORTHERN AND FLORIDA LARGEMOUTH BASS TO COLD SHOCK. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:19-24. 1980[1981]. SFA 27(2)

[Dep. Wildl. Fish Sci., Tex. A&M Univ., College Station 77843] Texas stocks of northern and Florida largemouth bass (*Micropterus salmoides salmoides* and *M. s. floridanus*) were compared for resistance to cold shock. The 45 advanced fingerlings of each subspecies had nearly identical rearing histories and were acclimated to a common temperature near 21 C. Laboratory tests were conducted at constant temperatures ranging from 5.3 to 13.5 C. Over all tests, more than twice as many Florida bass as northern bass died during the 7 days of observation. We estimated that the 96-h median tolerance limit was about 6C for northern bass and about 8.5C for the Florida bass. These findings are consistent with the hypothesis that Florida bass stocked outside their original range may suffer higher overwinter mortality, owing to lesser cold tolerance, than native northern bass.

82-000650 Claiborne, J. B.; D. H. Evans and L. Goldstein. FISH BRANCHIAL $Na+/NH_4+$ EXCHANGE IS VIA BASOLATERAL Na+-K+-ACTIVATED ATPASE. *J. Exp. Biol.* 96:431-434. Feb. 1982. SFA 27(2)

[Dep. Biol., Univ. Miami, Coral Gables, FL 33124]

82-000651 Cohen, A. H.; P. J. Holmes and R. H. Rand. THE NATURE OF THE COUPLING BETWEEN SEGMENTAL OSCILLATORS OF THE LAMPREY SPINAL GENERATOR FOR LOCOMOTION: A MATHEMATICAL MODEL. *J. Math. Biol.* 13(3):345-369. 1982. SFA

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[Dep. Rehab. Med. Pharmacol., Columbia Univ. Coll. Phys. Surgeons, New York, NY 10032]

82-000653 Crim, L. W. ENVIRONMENTAL MODULATION OF ANNUAL AND DAILY RHYTHMS ASSOCIATED WITH REPRODUCTION IN TELEOST FISHES. *Can. J. Fish. Aquatic Sci.* 39(1):17-21. Jan. 1982. In English with French summ. SFA 27(2)
[Mar. Sci. Res. Lab., Memorial Univ. Newfoundland, St. John's, NF A1C 5S7, Canada]

82-000654 Dabrowski, K. PROTEOLYTIC ENZYME ACTIVITY DECLINE IN STARVING FISH ALEVINS AND LARVAE. *Environ. Biol. Fishes* 7(1):73-76. 15 Jan. 1982. SFA 27(2)
[Inst. Ichthyobiol. Fish., Acad. Agric. Technol., 10-957 Olsztyn-Kortowo, Poland] An experiment to identify the point of no return of fish alevins and larvae has been made using the proteolytic activity as an index. Larvae of *Coregonus pollan* and *Salmo gairdneri* were starved or fed with zooplankton as a control and proteolytic enzymes measured. The lowest value of the total proteolytic activity coincides with the point of no return expressed in degree-days based on survival trials.

82-000655 Dabrowski, K. R. SEASONAL CHANGES IN THE CHEMICAL COMPOSITION OF FISH BODY AND NUTRITIONAL VALUE OF THE MUSCLE OF THE POLLAN (*COREGONUS POLLAN* THOMPSON) FROM LOUGH NEAGH, NORTHERN IRELAND. *Hydrobiologia* 87(2):121-141. 26 Feb. 1982. SFA 27(2)
[Inst. Ichthyol. Fish., Acad. Agric. Technol., 10-957 Olsztyn-Kortowo, Poland]

82-000656 Davie, P. S. CHANGES IN VASCULAR AND EXTRAVASCULAR VOLUMES OF EEL MUSCLE IN RESPONSE TO CATECHOLAMINES: THE FUNCTION OF THE CAUDAL LYMPHATIC HEART. *J. Exp. Biol.* 96:195-208. Feb. 1982. SFA 27(2)
[Dep. Physiol. Anat., Massey Univ., Palmerston North, New Zealand]

82-000657 Daxboeck, C. EFFECT OF CORONARY ARTERY ABLATION ON EXERCISE PERFORMANCE IN *SALMO GAIRDNERI*. *Can. J. Zool.* 60(3):375-381. Mar. 1982. In English with French summ. SFA 27(2)
[Dep. Zool., Univ. British Columbia, 6270 University Blvd., Vancouver, BC V6T 2A9, Canada]

82-000658 Demski, L. S. and P. J. Hornby. HORMONAL CONTROL OF FISH REPRODUCTIVE BEHAVIOR: BRAIN-GONADAL STEROID INTERACTIONS. *Can. J. Fish. Aquatic Sci.* 39(1):36-47. Jan. 1982. In English with French summ. SFA 27(2)
[Physiol. Group, Sch. Biol. Sci., Univ. Ky., Lexington 40506]

82-000659 Diana, J. S. AN EXPERIMENTAL ANALYSIS OF THE METABOLIC RATE AND FOOD UTILIZATION OF NORTHERN PIKE. *Comp. Biochem. Physiol. A Comp. Physiol.* 71(3):395-399. 1982. SFA 27(2)

PHYSIOLOGY (CONTINUED)

82-000659 CONTINUED
[Sch. Nat. Resour., Univ. Mich., Ann Arbor 48109] The metabolism of northern pike (*Esox lucius*) was determined by oxygen consumption and ration experiments to obtain data for an energy budget analysis. Metabolic measures of oxygen consumption were most reliable, and were described by the equations: $\dot{R}met = 27.5\ Wt^{0.82}$ and 14°C and $\dot{R}met = 1.6Wt^{0.97}$ at 2°C. In addition, conversion efficiency (K_2 = 0.319 ± 0.064) and assimilation efficiency (0.872 ± 0.060) were determined. Proximate composition of fish under various feeding regimes indicated that energy gain or depletion from the body was due to changes in amount of whole body tissue or body protein, rather than specific utilization or storage of lipid.

82-000660 DiMattio, J. and J. A. Zadunaisky. GLUCOSE TRANSPORT ACROSS OCULAR BARRIERS OF THE SPINY DOGFISH, *SQUALUS ACANTHIAS*. *J. Exp. Zool.* 219(2):197-203. 1 Feb. 1982. SFA 27(2)
[Dep. Ophthalmol., N.Y. Univ. Med. Cent., New York 10016]

82-000661 Djabali, M. and P. Pic. EFFECTS OF α AND β ADRENOCEPTORS ON BRANCHIAL CAMP LEVEL IN SEAWATER MULLET, *MUGIL CAPITO*. *Gen. Comp. Endocrinol.* 46(2):193-199. Feb. 1982. SFA 27(2)
[Stn. Mar. d'Endoume, rue Batterie des Lions, 13007 Marseille, France]

82-000662 Doneen, B. A. EFFECTS OF ADAPTATION TO SEA WATER, 170% SEA WATER AND TO FRESH WATER ON ACTIVITIES AND SUBCELLULAR DISTRIBUTION OF BRANCHIAL NA^+-Ka^+-ATPASE, LOW- AND HIGH AFFINITY CA^{++}-ATPASE, AND OUABAIN-INSENSITIVE ATPASE IN *GILLICHTHYS MIRABILIS*. *J. Comp. Physiol. B Biochem. Syst. Environ. Physiol.* 145(1):51-61. 1 Dec. 1981. SFA 27(2)
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[Dep. Pharmacol., Cent. Med. Univ., 1211 Genève 4, Switzerland]

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[Grad. Sch. Oceanogr., Univ. R.I., Kingston 02881]

82-000665 Eales, J. G. and G. L. Fletcher. CIRCANNUAL CYCLES OF THYROID HORMONES IN PLASMA OF WINTER FLOUNDER (*PSEUDOPLEURONECTES AMERICANUS* WALBAUM). *Can. J. Zool.* 60(3):304-309. Mar. 1982. In English with French summ. SFA 27(2)
[Dep. Zool., Univ. Manitoba, Winnipeg, MB R3T 2N2, Canada]

82-000666 Fay, R. R.; C. M. Hillery and K. Bolan. REPRESENTATION OF SOUND PRESSURE AND PARTICLE MOTION INFORMATION IN THE MIDBRAIN OF THE GOLDFISH. *Comp. Biochem. Physiol. A Comp. Physiol.* 71(2):181-191. 1982. SFA 27(2)
[Parmly Hearing Inst., Loyola Univ. Chicago, 6525 N. Sheridan Rd., Chicago, IL 60626]

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82-000667 Fletcher, G. L.; C. L. Hew and S. B. Joshi. ISOLATION AND CHARACTERIZATION OF ANTIFREEZE GLYCOPROTEINS FROM THE FROSTFISH, *MICROGADUS TOMCOD*. *Can. J. Zool.* 60(3):348-355. Mar. 1982. In English with French summ. SFA 27(2)
[Mar. Sci. Res. Lab., Memorial Univ. Newfoundland, St. John's, NF A1B 3X5, Canada]

82-000668 Foskett, J. K. HORMONAL CONTROL AND IONIC MODULATION OF TRANSPORT ACROSS THE OPERCULAR MEMBRANE OF THE EURYHALINE TELEOST, THE TILAPIA *SAROTHERODON MOSSAMBICUS*. *Ph.D. dissertation, Univ. Calif. (Berkeley)* 190p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(7):2718. Jan. 1982. SFA 27(2)

82-000669 Fostier, A.; R. Billard; B. Breton; M. Legendre and S. Marlot. PLASMA 11-OXOTESTOSTERONE AND GONADOTROPIN DURING THE BEGINNING OF SPERMIATION IN RAINBOW TROUT (*SALMO GAIRDNERI* R.). *Gen. Comp. Endocrinol.* 46(4):428-434. Apr. 1982. SFA 27(2)
[Inst. Nat. Rech. Agron., Lab. Physiol. Poissons, Campus de Beaulieu, 35042 Rennes Cedex, France]

82-000670 Garg, V. K. and V. P. Agrawal. IN VITRO INTESTINAL TRANSPORT OF D-GLUCOSE AND D-XYLOSE IN TWO TELEOSTS. *J. Anim. Physiol. Anim. Nutr.* 46(5):269-273. 1981. In English with German summ. SFA 27(2)
[Dep. Zool., D.A.V. Coll., Muzuaffarnagar, India 251001]

82-000671 Graham, J. B. and T. A. Baird. THE TRANSITION TO AIR BREATHING IN FISHES. I. ENVIRONMENTAL EFFECTS ON THE FACULTATIVE AIR BREATHING OF *ANCISTRUS CHAGRESI* AND *HYPOSTROMUS PLECOSTOMUS* (LORICARIIDAE). *J. Exp. Biol.* 96:53-67. Feb. 1982. SFA 27(2)
[Physiol. Res. Lab., Scripps Inst. Oceanogr., La Jolla, CA 92093]

82-000672 Gray, R. H.; T. L. Page; M. G. Saroglia and P. Bronzi. COMPARATIVE TOLERANCE TO GAS SUPERSTURATED WATER OF CARP, *CYPRINUS CARPIO*, AND BLACK BULLHEAD, *ICTALURUS MELAS*, FROM THE U.S.A. AND ITALY. *J. Fish Biol.* 20(2):223-227. Feb. 1982. SFA 27(2)
[Battelle, Pac. Northwest Lab., Richland, WA 99352] Supersaturation of surface water with atmospheric gases may result from hydroelectric or thermoelectric power generation and adversely affect aquatic biota. Although the phenomenon has been extensively studied in the northwestern United States, its occurrence is less well documented in Europe. We evaluated the tolerance of carp, *Cyprinus carpio*, and black bullhead, *Ictalurus melas*, from Italy to gas supersaturated water and compared our results to data reported in the literature for the same species from the Columbia River, U.S.A. Carp and black bullhead from Italy were more susceptible to gas supersaturation than those from the Columbia River. This may reflect greater adaptation of Columbia River fish due to their historical exposure to supersaturated water resulting from numberous hydroelectric dams.

82-000673 Gruber, S. H. ROLE OF THE LEMON SHARK, *NEGAPRION BREVIROSTRIS* (POEY) AS A PREDATOR IN THE TROPICAL MARINE ENVIRONMENT: A MULTIDISCIPLINARY STUDY. *Fla. Sci.* 45(1):46-75. 1982. SFA 27(2)
[Rosentiel Sch. Mar. Atmos. Sci., Univ. Miami, 4600 Richenbacker Causeway, Miami, FL 33149] Sharks are numerically important members of many marine communities, yet little is known of their role in these ecosystems. Recent technical developments in laboratory and field have facilitated investigation of the autecology of the lemon shark *Negaprion brevirostris* (Poey). This littoral shark is abundant, lives well in captivity and is ideally suited for

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82-000673 CONTINUED investigation. Over the past 24 mo we have marked and released 984 young sharks during a study of population dynamics. Each was injected with tetracycline for age validation. We tracked individual sharks for hundreds of km via ultrasonic telemetry thus determining activity rates, movements, home ranges and diel periods. We evaluated blood gas parameters, food intake, digestion, growth, resting and routine metabolism in the laboratory. These data provide estimates of the energy budget of the lemon shark and form a basis for understanding the flow of energy from environment to shark. Our tentative conclusion is that an adult lemon shark must remove nearly 1500 g of fish daily (1.6×10^6 calories) to account for its vital activities.

82-000674 Gupta, O. P. and W. Hanke. THE EFFECTS OF OSMOTIC STRESSORS ON THE STENOHALINE CARP *(CYPRINUS CARPIO). Comp. Biochem. Physiol. A Comp. Physiol.* 71(2):165-173. 1982. SFA 27(2)
[Dr. W. Hanke: Dep. Zool. II, Kaiserstr. 12, Univesity, D-7500 Karlsruhe, West Germany]

82-000675 Hart, N. H. and P. J. Pontier. ONTOGENY OF GLUCOSE-6-PHOSPHATE AND PHOSPHOGLUCONATE DEHYDROGENASES IN *BRACHYDANIO. Comp. Biochem. Physiol. B Comp. Biochem.* 71(2):193-200. 1982. SFA 27(2)
[Dep. Zool., Nelson Biol. Lab., P.O. Box 1059-Busch Campus, Piscataway, NJ 08854]

82-000676 Harvey, B. and J. B. Chamberlain. WATER PERMEABILITY IN THE DEVELOPING EMBRYO OF THE ZEBRAFISH, *BRACHYDANIO RERIO. Can. J. Zool.* 60(2):268-270. In English with French summ. SFA 27(2)
[Dep. Biol., Univ. Victoria, Victoria, BC V8W 2Y2, Canada]

82-000677 Haschemeyer, A. E. V. and R. W. Mathews. EFFECTS OF TEMPERATURE EXTREMES ON PROTEIN SYNTHESIS IN LIVER OF TOADFISH, *OPSANUS TAU, IN VIVO. Biol. Bull.* 162(1):18-27. Feb. 1982. SFA 27(2)
[Dep. Biol. Sci., Hunter Coll., City Univ. N.Y., New York 10021]

82-000678 Hegab, S. A. and W. Hanke. ELECTROLYTE CHANGES AND VOLUME REGULATORY PROCESSES IN THE CARP (*CYPRINUS CARPIO*) DURING OSMOTIC STRESS. *Comp. Biochem. Physiol. A Comp. Physiol.* 71(2):157-164. 1982. SFA 27(2)
[Dr. W. Hanke: Dep. Zool. II, Kaiserstr. 12, Univesity, D-7500 Karlsruhe, West Gemany]

82-000679 Heming, T. A. EFFECTS OF TEMPERATURE ON UTILIZATION OF YOLK BY CHINOOK SALMON (*ONCORHYNCHUS TSHAWYTSCHA*) EGGS AND ALEVINS. *Can. J. Fish. Aquatic Sci.* 39(1):184-190. Jan. 1982. In English with French summ. SFA 27(2)
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82-000680 Hickey, C. R., Jr. COMPARATIVE HEMATOLOGY OF WILD AND CAPTIVE CUNNERS. *Trans. Am. Fish. Soc.* 111(2):242-249. Mar. 1982. SFA 27(2)
[Environ. Eng. Br., U.S. Nuclear Regul. Comm., Washington, DC 20555]

82-000681 Hickey, G. M. WOUND HEALING IN FISH LARVAE. *J. Exp. Mar. Biol. Ecol.* 57(2-3):149-168. 22 Jan. 1982. SFA 27(2)
[Dunstaffnage Mar. Lab., Oban, Argyll, Scotland] Healing of skin lesions

PHYSIOLOGY (CONTINUED)

82-000681 CONTINUED has been investigated in herring, *Clupea harengus* L., plaice, *Pleuronectes platessa* L., and salmon, *Salmon salar* L., larvae. Healing was observed in vivo and by histology, the main response being as mass migration of epidermal cells from the periphery of the lesion. Wound areas of 0.1-7 mm^2 closed in 4-12 h, the mean rates of cell migration being 60-110 µm/h at 10-11°C. The rate of migration doubled with a 10°C rise in temperature. Normal skin structure was restored with regeneration of a new basement membrane and dermis within three weeks. Older stage larvae showed an inflammatory response similar to adult fish.

82-000682 Hilton, J. W. THE EFFECT OF PRE-FASTING DIET AND WATER TEMPERATURE ON LIVER GLYCOGEN AND LIVER WEIGHT IN RAINBOW TROUT, *SALMO GAIRDNERI* RICHARDSON, DURING FASTING. *J. Fish Biol.* 20(1):69-78. Jan. 1982. SFA 27(2)
[Dep. Nutr., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

82-000683 Hilton, J. W.; P. V. Hodson and S. J. Slinger. ABSORPTION, DISTRIBUTION, HALF-LIFE AND POSSIBLE ROUTES OF ELIMINATION OF DIETARY SELENIUM IN JUVENILE RAINBOW TROUT *(SALMO GAIRDNERI). Comp. Biochem. Physiol. C Comp. Pharmacol.* 71(1):49-55. 1982. SFA 27(2)
[Dep. Nutr., Coll. Biol. Sci., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

82-000684 Hoar, W. S. QUID USQUE ADHUC? QUO VADIMUS? *Can. J. Fish. Aquatic Sci.* 39(1):155-156. Jan. 1982. SFA 27(2)
[Dep. Zool., Univ. British Columbia, Vancouver, BC V6T 2A9, Canada]

82-000685 Hofer, R.; H. Forstner and R. Rettenwander. DURATION OF GUT PASSAGE AND ITS DEPENDENCE ON TEMPERATURE AND FOOD CONSUMPTION IN ROACH, *RUTILUS RUTILUS* L: LABORATORY AND FIELD EXPERIMENTS. *J. Fish Biol.* 20(3):289-299. Mar. 1982. SFA 27(2)
[Inst. Zoophysiol., Univ. Innsbruck, A-6020 Innsbruck, Austria] A laboratory method is described by means of which gut passage time as a function of temperature, diet and consumption rate is investigated in roach, an omnivorous cyprinid. Rates of food passage are accelerated by increasing temperature and food consumption. Equations for the regressions between gut passage time and consumption rate at four temperatures are given. Animal food causes a delay in gut passage time. In adult roach (30-100g body weight) gut passage time was found to be independent of size. A field method was also developed which allows the direct estimation of gut passage time and consumption rate in natural fish populations. The results of experiments with this field method agree with those of laboratory experiments.

82-000686 Holmgren, S.; C. Vaillant and R. Dimaline. VIP-, SUBSTANCE P-, GASTRIN/CCK-, BOMBESIN-, SOMATOSTATIN- AND GLUCAGON-LIKE IMMUNOREACTIVITIES IN THE GUT OF THE RAINBOW TROUT, *SALMO GAIRDNERI. Cell Tissue Res.* 223(1):141-153. Feb. 1982. SFA 27(2)
[Dep. Zool., Univ. Göteborg, Göteborg, Sweden]

82-000687 Houston, A. H. and K. M. Mearow. BRANCHIAL AND RENAL (Na^+/K^+) ATPASE AND CARBONIC ANHYDRASE ACTIVITIES IN A EURYTHERMAL FRESHWATER TELEOST, *CARASSIUS AURATUS* L. *Comp. Biochem. Physiol. A Comp. Physiol.* 71(2):175-180. 1982. SFA 27(2)
[Dep. Biol. Sci., Brock Univ., Box 365, Lewiston, NY 14092]

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82-000688 Huebner, J. D. and R. W. Langton. RATE OF GASTRIC EVACUATION FOR WINTER FLOUNDER, *PSEUDOPLEURONECTES AMERICANUS*. *Can. J. Fish. Aquatic Sci.* 39(2):356-360. Feb. 1982. In English with French summ. SFA 27(2)
[Dep. Biol., Univ. Winnipeg, Winnipeg, MB R3B 2E9, Canada]

82-000689 Hunt, S. M. V.; T. H. Simpson and R. S. Wright. SEASONAL CHANGES IN THE LEVELS OF 11-OXOTESTOSTERONE AND TESTOSTERONE IN THE SERUM OF MALE SALMON, *SALMO SALAR* L., AND THEIR RELATIONSHIP TO GROWTH AND MATURATION CYCLE. *J. Fish Biol.* 20(1):105-119. Jan. 1982. SFA 27(2)
[D.A.F.S. Mar. Lab., Aberdeen AB9 8DB, Scotland]

82-000690 Huth, A. and T. A. Rapoport. REGULATION OF THE BIOSYNTHESIS OF INSULIN IN ISOLATED BROCKMANN BODIES OF THE CARP *(CYPRINUS CARPIO)*. *Gen. Comp. Endocrinol.* 46(2):158-167. Feb. 1982. SFA 27(2)
[Zentralinst. Molekularbiol. Akad. Wissenschaften DDR, Berlin-Buch, East Germany]

82-000691 Ikeda, Y. and H. Ozaki. [CHANGES OF VARIOUS SERUM CONSTITUENT LEVELS BY HEMOLYSIS IN CARP (THE STUDIES ON HEMOCHEMICAL HEALTH ASSESSMENT IN FISH-II).] *Bull. Jpn. Soc. Sci. Fish.* 47(12):1647. Dec. 1981. In Japanese. SFA 27(2)
[Tokyo Univ. Fish., 5-7, Konan-4, Minato, Tokyo 108, Japan]

82-000692 Ikeda, Y. and H. Ozaki. [THE EXAMINATION OF TAIL PEDUNCLE SEVERING BLOOD SAMPLING METHOD FROM ASPECT OF OBSERVED SERUM CONSTITUENT LEVELS IN CARP.] *Bull. Jpn. Soc. Sci. Fish.* 47(11):1477-1453. Nov. 1981. In Japanese with English summ. SFA 27(2)
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82-000693 Ince, B. W. PLASMA CLEARANCE KINETICS OF UNLABELLED BOVINE INSULIN IN RAINBOW TROUT (*SALMO GAIRDNERI*). *Gen. Comp. Endocrinol.* 46(4):463-472. Apr. 1982. SFA 27(2)
[Dep. Biol. Sci., Univ. Aston, Gosta Green, Birmingham B4 7ET, England]

82-000694 Jones, P. L. and B. D. Sidell. METABOLIC RESPONSES OF STRIPED BASS (*MORONE SAXATILIS*) TO TEMPERATURE ACCLIMATION. II. ALTERATIONS IN METABOLIC CARBON SOURCES AND DISTRIBUTIONS OF FIBER TYPES IN LOCOMOTORY MUSCLE. *J. Exp. Zool.* 219(2):163-171. 1 Feb. 1982. SFA 27(2)
[B.D. Sidell: Dep. Zool., Migratory Fish Res. Inst., Univ. Me., Orono 04469]

82-000695 Kime, D. E. and G. V. Callard. FORMATION OF 15α-HYDROXYLATED ANDROGENS BY THE TESTIS AND OTHER TISSUES OF THE SEA LAMPREY, *PETROMYZON MARINUS*, IN VITRO. *Gen. Comp. Endocrinol.* 46(2):267-270. Feb. 1982. SFA 27(2)
[Dep. Zool., The University, Sheffield S10 2TN, England]

82-000696 Kitajima, C.; Y. Tsukashima; S. Fujita; T. Watanabe and Y. Yone. [RELATIONSHIP BETWEEN UNINFLATED SWIM BLADDERS AND LORDOITIC DEFORMITY IN HATCHERY-REARED RED SEA BREAM *PAGRUS MAJOR.*] *Bull. Jpn. Soc. Sci. Fish.* 47(10):1289-1294. Oct. 1981. In Japanese with English summ. SFA 27(2)
[Aquacult. Res. Lab., Nagasaki Pref. Inst. Fish., Nomozaki, Nagasaki 851-05, Japan] The lordosis frequently observed in hatchery-reared red sea

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82-000696 CONTINUED bream, a big problem in the seed production in Japan, is known to be induced in the fish with uninflated swim bladders. Rearing experiments were conducted to determine whether the abnormally developed swim bladders were due to failure in gulping air at the water surface. One tank was sealed with a layer of liquid paraffin and the other with open surface served as a control. Over 90% of the larvae had normal swim bladders at around 7th day after initial feeding (4.2 mm in total length) in the control, whereas none was inflated in the sealed tank. On the other hand, the lordosis began to appear at around 40th day after hatching in the fish with uninflated swim bladder and more than 90% of the fish showed characteristic lordosis at the end of the feeding trial of 120 days. Thus, it has been shown that gulping air at the water surface is essential for the initial swim bladder inflation and that the uniflation is closely related to the development of lordotic deformity. The relationship between the nutritional quality of rotifers or rearing conditions such as aeration and swim bladder inflation is also discussed.

82-000697 Klinger, S. A.; J. J. Magnuson and G. W. Gallepp. SURVIVAL MECHANISMS OF THE CENTRAL MUDMINNOW (*UMBRA LIMI*), FATHEAD MINNOW (*PIMEPHALES PROMELAS*) AND BROOK STICKLEBACK (*CULAEA INCONSTANS*) FOR LOW OXYGEN IN WINTER. *Environ. Biol. Fishes* 7(2):113-120. 15 Mar. 1982. SFA 27(2)

[Lab. Limnol., Dep. Zool., Univ. Wis., Madison 53706] Three species (central mudminnow, fathead minnow and brook stickleback) survive when a northern Wisconsin lake becomes anoxic in winter. Some gas bubbles beneath the ice contained as much as 11% oxygen when the lake contained <0.30 mg l^{-1} dissolved oxygen. Experiments conducted in the field determined that gas bubbles prolonged survival of all species, especially the mudminnow and stickleback. In the laboratory, brook sticklebacks exhibited the lowest and fathead minnows the highest routine metabolic rate corrected for weight. Rate of gill ventilation of all three increased from 20 to 70 beats per minute as oxygen levels declined from 4.0 to 0.25 mg l^{-1}. At low oxygen levels they moved to the upper one-third of the test tanks. Small size, low metabolic rate, tolerance of low oxygen conditions and reduced activity resulted in reduced demand for dissolved oxygen. Head shape, ventilation rate, vertical movement and utilization of high oxygen microzones also enhanced exploitation of low levels of dissolved oxygen. Central mudminnows used oxygen directly from gas bubbles found under the ice.

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[Sch. Biol. Sci., Univ. Sydney, New South Wales, Australia]

82-000700 Lapkin, V. V.; A. M. Svirsky and V. K. Golovanov. [AGE DYNAMICS OF SELECTED AND LETHAL TEMPERATURES IN FISHES.] *Zool. Zh.* 60(12):1792-1801. 1981. In Russian with English summ. SFA 27(2)

[Inst. Biol. Inland Waters, USSR Acad. Sci., Borok, Yaroslavl Reg., USSR] The ultimate selected and ultimate upper lethal temperatures were studied in *Abramis brama*, *Rutilus rutilus* and *Perca fluviatilis* with respect to the age. On the basis of the data obtained and published elsewhere, a model of dynamics of the optimal (selected) temperatures and thermal tolerance of fishes during ontogenesis has been constructed. The zone of thermal tolerance

PHYSIOLOGY (CONTINUED)

82-000700 CONTINUED was shown to be minimal in the beginning of embryogenesis, attain the maximum during the period of fry development and narrow gradually down in adult fishes. The dynamics of optimal temperatures has a more complicated pattern. The application of theoretical concepts on the functioning of dynamic open systems for the description of thermal adaptive properties of fishes is discussed.

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[Dep. Zool., Univ. Manitoba, Winnipeg, MB R3T 2N2, Canada]

82-000703 Matsumiya, M. and S. Otake. [THE INVESTIGATION OF DIAMINE OXIDASE-LIKE ENZYMES IN THE VARIOUS ORGANS OF FISHES.] *Bull. Jpn. Soc. Sci. Fish.* 47(12):1599-1604. Dec. 1981. In Japanese with English summ. SFA 27(2)
[Coll. Agric. Vet. Med., Nihon Univ., 34-1, Shimouma-3, Setagaya, Tokyo 154, Japan]

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[Dep. Biol. Sci., Univ. Lancaster, Bailrigg, Lancaster LA1 4YQ, England]

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[S. Bhattacharya: Dep. Zool., Sch. Life Sci., Visva-Bharati Univ., Santiniketan-731235, West Bengal, India]

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82-000709 Nahhas, R.; N. V. Jones and G. Goldspink. SOME ASPECTS OF SUSTAINED TRAINING OF RAINBOW TROUT, *SALMO GAIRDNERI* RICHARDSON. *J. Fish Biol.* 20(3):351-358. Mar. 1982. SFA 27(2)
[Zool. Dep., Univ. Hull, Hull HU6 7RX, England] Groups of 6-7cm length rainbow trout, *Salmo gairdneri* Richardson, were simultaneously trained at four water velocities (0, 1.4, 2.2 and 3.5Ls^{-1}) for a period of 46 days. Oxygen consumption and swimming ability (fatigue time) were then measured. Only training at 3.5 Ls^{-1} increased the swimming ability of the fish. A study of the relative proportion of the white and red muscles indicated that the white muscle was increasing its mass at velocities in excess of 2.2 Ls^{-1}. The oxygen consumption rate of the trained fish was lower than that of the untrained fish when considered over the whole velocity range.

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[Dep. Zool., Div. Physiol., Univ. Helsinki, Arkadiankatu 7, SF-00100 Helsinki 10, Finland]

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[Dep. Zool., Univ. Fla., Gainesville 32611] The osmoregulatory capabilities of juvenile striped mullet, *Mugil cephalus* L., of three size-groups (20-29, 30-39 and 40-69mm s.l.) were compared in a series of six salinities ranging from fresh water to full sea water. The two smaller size-groups were able to tolerate instantaneous transfer from the brackish water in which captured, to all salinities but fresh water, while the 40-69mm group were tolerant of instantaneous transfer to all experimental salinities. At high environmental salinities, the osmotic regulatory capabilities improved with growth in size to an apparently definitive condition in fish of 40-69mm s.l. The osotic regulatory capability in waters of low salinity had reached a definitive state with the development of tolerance to such salinities. The ontogenetic pattern from *Mugil cephalus* is virtually identical to that of the Atlantic salmon, *Salmo salar*.

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[Stn. Mar. d'Endoume, rue Batterie des Lions, 13007 Marseille, France]

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[Freshwater Biol. Assoc., The Ferey House, Far Sawrey, North Ambleside, Cumbria, LA22 0LP, England] The response of the brown trout to a single, short (*c.* 2 min) incidence of handling stress was monitored for a period of 1 month post-stress. Significant changes were found in feeding behaviour, in the levels of plasma cortisol, glucose and lactate, in the concentration of circulating lymphocytes and in the degree of epidermal mucification. No changes were detected in the growth rate and coefficient of condition, in the levels of plasma thyroxine, in the concentrations of circulating erythrocytes, neutrophils and thrombocytes or in the thickness of the epidermis. The time-course for recovery of each parameter was examined and from this it was concluded that a minimum of 2 weeks was required for complete recovery and a return to normality.

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[Dep. Biol., Coll. Staten Island, 715 Ocean Terrace, Staten Island, NY 10301]

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82-000730 Scott, A. P.; E. L. Sheldrick and A. P. F. Flint. MEASUREMENT OF 17α,20β-DIHYDROXY-4-PREGNEN-3-ONE IN PLASMA OF TROUT (*SALMO GAIRDNERI* RICHARDSON): SEASONAL CHANGES AND RESPONSE TO SALMON PITUITARY EXTRACT. *Gen. Comp. Endocrinol.* 46(4):444-451. Apr. 1982. SFA 27(2)
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[Natl. Inst. Water Supply, Chem. Biol. Div., P.O. Box 150, 2260AD Leidschendam, Netherlands]

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[Dep. Biol., Chinese Univ. Hong Kong, Shatin, Hong Kong] Snakeheads were adapted to fresh water (1 mOsm kg^{-1}), 25% sea water (230 mOsm kg^{-1}), 33% sea water (320 mOsm kg^{-1}) and 40% sea water (380 mOsm kg^{-1}) for 20 days. Exposure to salt water resulted in tissue dehydration, elevations of plasma osmolality, Na^+, Mg^{2+}, Cl^- and protein concentrations and stimulation of branchial Na^+-K^+-ATPase activity. These changes were accompanied by concomitant decline of the hepatosomatic index and liver glycogen concentration. The routine rate of oxygen consumption was increased in snakeheads adapted to 33% sea water. These data were taken to indicate a stressful effect of salinity to the snakehead despite documentation of its ability to penetrate into brackish waters.

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[Dep. Biol., McMaster Univ., Hamilton, ON L8S 4K1, Canada]

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GENETICS, VARIATION STUDIES AND HYBRIDIZATION

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82-000767 Casselman, J. M.; J. J. Collins; E. J. Crossman; P. E. Ihssen and G. R. Spangler. LAKE WHITEFISH (*COREGONUS CLUPEAFORMIS*) STOCKS OF THE ONTARIO WATERS OF LAKE HURON. *Can. J. Fish. Aquatic Sci.* 38(12):1772-1789. Dec. 1981. In English with French summ. SFA 27(2)
[Ontario Minist. Nat. Resour., Res. Sect., Fish. Br., Maple, ON L0J 1E0, Canada]

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[Ontario Minist. Nat. Resour., P.O. Box 5000, Thunder Bay, ON P7C 5G6, Canada]

82-000769 Dehring, T. R.; A. F. Brown; C. H. Daughtery and S. R. Phelps. SURVEY OF THE GENETIC VARIATION AMONG EASTERN LAKE SUPERIOR LAKE TROUT (*SALVELINUS NAMAYCUSH*). *Can. J. Fish. Aquatic Sci.* 38(12):1728-1746. Dec. 1981. In English with French summ. SFA 27(2)
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[Ontario Minist. Nat. Resour., Res. Sect., Fish. Br., Maple, ON L0J 1E0, Canada]

82-000773 Kazákov, R. V. and S. A. Ilyenkova. [IDENTIFICATION OF RECIPROCAL HYBRIDS OF THE ATLANTIC SALMON AND SEA TROUT BY THE VARIABILITY OF THE WEIGHT OF OVULATED EGGS.] *Genetika* 18(1):154-160. 1982. In Russian with English summ. SFA 27(2)
[State Res. Inst. Lake River Fish., Leningrad, USSR] A sample of salmons, whose eggs were obtained for Narva hatchery was studied. Hybrid fish has been found to be highly variable concerning the weight of ovulated eggs (V=30-40%, max/min=4-5), as compared with the parental species (V=5-6%, max/min=1.2-1.4). The level of variability in the weight of ovulated eggs is suggested as a criterion for identification of hybrid females which cannot be distinguished from the Atlantic salmon and sea trout by their appearance with a view to cull them.

82-000774 Khuda-Bukhsh, A. R. KARYOMOPHOLOGY OF TWO SPECIES OF *TOR* (PISCES; CYPRINIDAE) WITH A HIGH NUMBER OF CHROMOSOMES. *Experientia (Basel)* 38(1):82-83. 15 Jan. 1982. SFA 27(2)

GENETICS, VARIATION STUDIES AND HYBRIDIZATION (CONTINUED)

82-000774 CONTINUED
[Dep. Zool., Univ. Kalyani, Kalyani-741235, India] The karyotypes of *Tor khudree* and *Tor tor*, occurring in the Himalayan streams in India, are described. As reported earlier for *T. putitora*, the diploid complements in these 2 congeneric species also comprise 100 chromosomes. The modal number being 2n=50 in this family, *Tor* appears to be of tetraploid origin.

82-000775 Krueger, C. C. and G. R. Spangler. GENETIC IDENTIFICATION OF SEA LAMPREY (*PETROMYZON MARINUS*) POPULATIONS FROM THE LAKE SUPERIOR BASIN. *Can. J. Fish. Aquatic Sci.* 38(12):1832-1837. Dec. 1981. In English with French summ. SFA 27(2)
[Wis. Dep. Nat. Resour., 101 South Webster St., GEF II, Box 7921, Madison 53707]

82-000776 Larkin, P. A. A PERSPECTIVE ON POPULATION GENETICS AND SALMON MANAGEMENT. *Can. J. Fish. Aquatic Sci.* 38(12):1469-1475. Dec. 1981. SFA 27(2)
[Inst. Anim. Resour. Ecol., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

82-000777 Leary, R. and H. E. Booke. GENETIC STOCK ANALYSIS OF YELLOW PERCH FROM GREEN BAY AND LAKE MICHIGAN. *Trans. Am. Fish. Soc.* 111(1):52-57. Jan. 1982. SFA 27(2)
[H.E. Booke: Mass. Coop. Fish. Res. Unit, Univ. Mass., Holdsworth Hall, Amherst 01003]

82-000778 Philipp, D. P.; W. F. Childers and G. S. Whitt. MANAGEMENT IMPLICATIONS FOR DIFFERENT GENETIC STOCKS OF LARGEMOUTH BASS (*MICROPTERUS SALMOIDES*) IN THE UNITED STATES. *Can. J. Fish. Aquatic Sci.* 38(12):1715-1723. Dec. 1981. In English with French summ. SFA 27(2)
[Aquatic Biol. Sect., Ill Nat. Hist. Surv., Urbana 61801]

82-000779 Ryder, R. A.; S. R. Kerr; W. W. Taylor and P. A. Larkin. COMMUNITY CONSEQUENCES OF FISH STOCK DIVERSITY. *Can. J. Fish. Aquatic Sci.* 38(12):1856-1866. Dec. 1981. In English with French summ. SFA 27(2)
[Ontario Minist. Nat. Resour., Box 2089, Thunder Bay, ON P7B 5E7, Canada]

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[Dep. Genet., Univ. Stockholm, Box 6801, S-113 86, Stockholm, Sweden]

82-000781 Swinney, G. N. and T. F. Coles. DESCRIPTION OF TWO HYBRIDS INVOLVING SILVER BREAM, *BLICCA BJOERKNA* (L.), FROM BRITISH WATERS. *J. Fish Biol.* 20(2):121-129. Feb. 1982. SFA 27(2)
[R. Scott. Mus., Chambers St., Edinburgh, Scotland]

82-000782 Thompson, D.; C. E. Purdom and B. W. Jones. GENETIC ANALYSIS OF SPONTANEOUS GYNOGENETIC DIPLOIDS IN THE PLAICE *PLEURONECTES PLATESSA*. *Heredity* 47(2):269-274. Oct. 1981. SFA 27(2)

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[Minist. Agric. Fish. Food, Fish. Lab., Lowestoff, Suffolk NR33 0HT, England]

82-000783 Thorpe, J. E. and K. A. Mitchell. STOCKS OF ATLANTIC SALMON (*SALMO SALAR*) IN BRITAIN AND IRELAND: DISCRETENESS, AND CURRENT MANAGEMENT. *Can. J. Fish. Aquatic Sci.* 38(12):1576-1590. Dec. 1981. In English with French summ. SFA 27(2)
[Freshwater Fish. Lab., Pitlochry, Perthshire PH16 5LB, Scotland]

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[Freshwater Fish. Lab., Pitlochry PH16 5LB, Scotland]

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[U.S. FWS, Great Lakes Fish. Lab., Ann Arbor, MI 48105]

82-000786 Wallace, R. K., Jr. and J. S. Ramsey. A NEW CYPRINID HYBRID, *NOTROPIS LUTRENSIS* X *N. CALLITAENIA*, FROM THE APALACHICOLA DRAINAGE IN ALABAMA. *Copeia* 1982(1):214-217. 23 Feb. 1982. SFA 27(2)
[Ala. Coop. Fish. Res. Unit, Auburn Univ., Auburn, AL 36849]

82-000787 Whitmore, D. H. and W. Butler. INTERSPECIFIC HYBRIDIZATION OF SMALLMOUTH AND GUADALUPE BASS (*MICROPTERUS*): EVIDENCE BASED ON BIOCHEMICAL GENETIC AND MORPHOLOGICAL ANALYSES. *Southwest. Nat.* 27(1):99-106. 19 Feb. 1982. SFA 27(2)
[Dep. Biol., Univ. Tex., Arlington 76019] A rare incidence of natural interspecific hybridization has occurred in south-central Texas as a result of secondary contact between two allopatrically evolved species, smallmouth bass (*Micropterus dolomieui*) and Guadalupe bass (*M. treculi*). Hybridization was initiated by the stocking of smallmouth bass into the habitat of the endemic Guadalupe bass. The extent of hybridization and genetic introgression has been analyzed using a meristic index and diagnostic allozyme loci. Because hybridization is a relatively recent event, little evidence of genetic introgression was found. However, the possiblity of future introgression remains as a threat to the genetic integrity of the Guadalupe bass population.

82-000788 Williams, J. G. ELECTROPHORETIC VARIATION AMONG NINE SPECIES OF THE GENUS *CYPRINODON* (CYPRINODONTIDAE). *Ph.D. dissertation, Univ. Tex.* 158p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(7):2738. Jan. 1982. SFA 27(2)

82-000789 Wolters, W. R.; C. L. Chrisman and G. S. Libey. ERYTHROCYTE NUCLEAR MEASUREMENTS OF DIPLOID AND TRIPLOID CHANNEL CATFISH, *ICTALURUS PUNCTATUS* (RAFINESQUE). *J. Fish Biol.* 20(3):253-258. Mar. 1982. SFA 27(2)
[C.L. Chrisman: Dep. Anim. Sci., Purdue Univ., West Lafayette, IN 47907] Minor axis, major axis, and volume measurements of erythrocyte nuclei were compared by discriminant analysis to determine which variable best predicted ploidy levels. Predicted correct classification percentages for minor axis, volume, major axis, and all variables combined were 81.33, 86.21, 92.36 and

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82-000789 CONTINUED 92.65%, respectively. Minor axis and volume measurements were not as accurate in predicting ploidy levels because nuclear shape changed as the ploidy level changed from the diploid to triploid state. Mean major axis measurements alone classified 92.36% of the fish correctly with a discriminant level of 4.726µm.

82-000790 Wolters, W. R.; G. S. Libey and C. L. Chrisman. EFFECT OF TRIPLOIDY AND GROWTH AND GONAD DEVELOPMENT OF CHANNEL CATFISH. *Trans. Am. Fish. Soc.* 111(1);102-105. Jan. 1982. SFA 27(2)
[Dep. For. Nat. Resour., Purdue Univ., West Lafayette, IN 47907]

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82-000791 Barnett, C. THE CHEMOSENSORY RESPONSES OF YOUNG CICHLID FISH TO PARENTS AND PREDATORS. *Anim. Behav.* 30(1):35-42. Feb. 1982. SFA 27(2)
[Dep. Ethol., Univ. Bielefeld, P.O. Box 8640, 4800 Bielefeld, West Germany]

82-000792 Barton, M. COMPARATIVE DISTRIBUTION AND HABITAT PREFERENCES OF TWO SPECIES OF STICHAEOID FISHES IN YAQUINA BAY, OREGON. *J. Exp. Mar. Biol. Ecol.* 59(1):77-87. 12 Mar. 1982. SFA 27(2)
[Div. Sci. Math., Cent. Coll. Ky., Darrville 40422]

82-000793 Bentley, T. B. and M. L. Wiley. INTRA- AND INTER-SPECIFIC VARIATION IN BUOYANCY OF SOME ESTUARINE FISHES. *Environ. Biol. Fishes* 7(1):77-81. 15 Jan. 1982. SFA 27(2)
[Rosenstiel Sch. Mar. Atmos. Sci., Univ. Miami, 4600 Rickenbacker Causeway, Miami, FL 33149] Buoyancy was measured on eight species of estuarine fishes that were caught in 1m depth or less. Mean buoyancies of the physoclists *Fundulus heteroclitus, F. majalis, Cyprinodon variegatus* and *Leiostomus xanthurus* were similar and ranged from -6.5 to -18.00 kiloPascals below atmospheric pressure at sea level. *Menidia menidia* and *Pomatomus saltatrix* measured -36.6 and -46.1 kPa, respectively. Two physostomes, *Brevoortia tyrannus* and *Anchoa mitchilli*, measured +2.9 and -23.5 kPa, respectively, but the latter probably releases air when handled. The four most buoyant physoclist species live near the bottom in areas that receive daily tide induced currents. Negative buoyancy probably functions in them as in stream dwelling minnows and salmonids, which respond to currents by decreasing their buoyancy. The pronounced negative buoyancy of *M. menidia* may be a response to a preference for habitat where the currents are stronger. *P. saltatrix*, which can secrete gas into the swim bladder at the fastest rate known for any fish, combines high secretion (and resorption) rates with marked negative buoyancy. This enables it to quickly change depths over a wide vertical range, without overexpanding the swim bladder to cause positive buoyancy.

82-000794 Beulig, A. SOCIAL AND EXPERIENTIAL FACTORS IN THE RESPONSIVENESS OF SHARKS TO SOUND. *Fla. Sci.* 45(1):2-10. 1982. SFA 27(2)
[Div. Nat. Sci., New Coll. Univ. South Fla., Sarasota 33580] The responses to low-frequency, irregularly-pulsed sounds of juvenile lemon sharks (*Negaprion brevirostris*) that were born in captivity and deprived of normal experience were measured. These sounds were produced by a mechanical device oscillating a transparent plastic flipper at a frequency of 12.5 Hz. The sounds were known to attract juvenile sharks that were captured in the field but experientially-deprived sharks were not attracted to these sounds

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82-000794 CONTINUED in initial tests. The sharks were then provided with opportunities to capture living prey and to experience auditory stimulation associated with wounded, struggling fish. These experiences were not sufficient to overcome the possible inhibitory effect on responsiveness of social isolation during testing. To verify the existence of a social factor the sharks were then tested in groups of three. Their approach-response level indicated attraction and compared favorably with juvenile sharks that had species-typical feeding and rearing experiences. Due to the confounding of social conditions during testing with experience in the present work it is not possible to isolate the roles of experiential and social factors in responsiveness to sounds. Suggestions for further research are made to resolve these issues.

82-000795 Brett, B. L. H. GENETICS AND BEHAVIOR OF SYMPATRIC SPECIES OF MOLLIES (PISCES: POECILIIDAE: *POECILIA*) IN MIDDLE AMERICA. *Ph.D. dissertation, Univ. Mich.* 124p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(9):3600. Mar. 1982. SFA 27(2)

82-000796 Brett, B. L. H. and D. J. Grosse. A REPRODUCTIVE PHEROMONE IN THE MEXICAN POECILIID FISH *POECILIA CHICA*. *Copeia* 1982(1):219-223. 23 Feb. 1982. SFA 27(2)
[Dep. Biol., Univ. Rochester, Rochester, NY]

82-000797 Burgess, J. W. and E. Shaw. EFFECTS OF *ACOUSTICO-LATERALIS* DENERVATION IN A FACULTATIVE SCHOOLING FISH: A NEAREST-NEIGHBOR MATRIX ANALYSIS. *Behav. Neural Biol.* 33(4):488-497. Dec. 1981. SFA 27(2)
[Mental Retardation Res. Cent., 760 Westwood Blvd., UCLA Med. Sch., Los Angeles, CA 90024] Spacing responses in schools of golden shiner fish were measured before and after surgical section of the posterior lateral line (*acoustico-lateralis*) nerves. Test fish swam closer to their five nearest schoolmates after surgery and maintained less parallel orientation to their nearest neighbors. These findings indicate a significant role of lateral line input in the spacing responses of these facultative-schooling freshwater fish. Fish maintained nonrandom patterns of spacing toward their five nearest schoolmates before surgery, distinguished by closer distances, more parallel orientation, and greater avoidance of positions behind schoolmates than expected by chance. Analysis revealed that both school structure and behavioral changes after lateral line surgery resemble what is known of obligate-schooling marine fish species. Results are discussed in the context of lateral line function in fish spacing responses and the role of sensory input in fish schooling.

82-000798 Calhoun, S. W.; E. G. Zimmerman and T. L. Beitinger. STREAM REGULATION ALTERS ACUTE TEMPERATURE PREFERENDA OF RED SHINERS, *NOTROPIS LUTRENSIS*. *Can. J. Fish. Aquatic Sci.* 39(2):360-363. Feb. 1982. In English with French summ. SFA 27(2)
[Dep. Biol., Tex. A&M Univ., College Station 77843]

82-000799 Casterlin, M. E. and W. W. Reynolds. THERMOREGULATORY BEHAVIOR AND DIEL ACTIVITY OF YEARLING WINTER FLOUNDER, *PSEUDOPLEURONECTES AMERICANUS* (WALBAUM). *Environ. Biol. Fishes* 7(2):177-180. 15 Mar. 1982. SFA 27(2)
[Mar. Biol. Prog., Univ. New England, Biddeford, ME 04005] Sixteen yearling winter flounder, tested individually for 3-day periods in electronic shuttleboxes, voluntarily occupied an 8-27°C range of temperature, with a modal final thermal preferendum of 18.5°C (mean 18.7°C, median 19°C, midpoint 17.5°C, s.d. 1.9°C, S_k+0.33). The locomotor activity pattern of the

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82-000799 CONTINUED yearling fish in the laboratory was markedly nocturnal, with mean hourly nocturnal activity exceeding mean hourly diurnal activity by a factor of 3.4. Maximum activity occurred at 0300 EST, minimum activity at 1400 EST. While activity generally increased with temperature, a local activity minimum occurred at 18.7°C, coinciding with the 24-hour mean final thermal preferendum. Comparison of these laboratory data with previously published field data suggest that behavioral responses to temperature and light play significant roles in determining age- and size-specific differences in seasonal depth stratification and onshore-offshore distributions in this species.

82-000800 Clark, D. T. VISUAL RESPONSES IN DEVELOPING ZEBRAFISH (*BRACHYDANIO RERIO*). *Ph.D. dissertation, Univ. Oreg.* 149p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(8):3077. Feb. 1982. SFA 27(2)

82-000801 Clayton, D. A. and T. C. Vaughan. PENTAGONAL TERRITORIES OF THE MUDSKIPPER *BOLEOPHTHALMUS BODARTI* (PISCES: GOBIIDAE). *Copeia* 1982(1):232-234. 23 Feb. 1982. SFA 27(2)
[Dep. Zool., Kuwait Univ., P.O. Box 5969, Kuwait]

82-000802 Douglas, R. H. AN ENDOGENOUS CREPUSCULAR RHYTHM OF RAINBOW TROUT (*SALMO GAIRDNERI*) PHOTOMECHANICAL MOVEMENTS. *J. Exp. Biol.* 96:377-388. Feb. 1982. SFA 27(2)
[Univ. Ulm, Abt. Klin. Morphol., 79 Ulm (Donau), Neubau Oberer Eselberg, West Germany] The position of the epithelial pigment and cones in the retina of *Salmo gairdneri* was determined during extended periods of darkness in fish entrained to both artificial and natural light/dark cycles. An endogenous rhythm of such photomechanical movements, unique among species so far examined, was observed in both groups of fish, with two peaks of light adaptation coincident with dawn and dusk. It is suggested that such an apparently non-adaptive physiological rhythm is related to the behavioural pattern of trout and reveals a basic crepuscular organisation. No endogenous rhythm was observed in continual light. These results suggest that control of photomechanical changes in rainbow trout has two components: an endogenous component, that causes the bimodal pattern in maintained darkness, and a direct effect of light, that maintains light adaptation throughout a normal day.

82-000803 Dubin, R. E. BEHAVIORAL INTERACTIONS BETWEEN CARIBBEAN REEF FISH AND EELS (MURAENIDAE AND OPHICHTHIDAE). *Copeia* 1982(1):229-232. 23 Feb. 1982. SFA 27(2)
[Dep. Zool., Univ. Alberta, Edmonton, AB T6G 2E9, Canada]

82-000804 Hayase, S. and S. Tanaka. INTER-SPECIFIC RELATIONS SURROUNDING THE THREE SPECIES OF EMBIOTOCID FISHES IN THE *ZOSTERA MARINA* BELT OF ODAWA BAY. *Bull. Jpn. Soc. Sci. Fish.* 47(10):1317-1322. Oct. 1981. SFA 27(2)
[SEAFDEC, P.O. Box 4, Phrapradaeng, Samutprakarn, Thailand] Inter-specific relations concerning three species of embiotocid fishes, *Ditrema viridis*, *Ditrema temmincki* and *Neoditrema ransonneti*, in the *Zostera* belt of Odawa Bay are discussed in the present paper. From the seasonal changes in fish fauna appearing in the *Zostera* belt, the utilization of the *Zostera* belt as a habitat of fishes was examined. *D. viridis* and *D. temmincki* are members of year-round residents and *N. ransonneti* is one of the seasonal residents. The 0+ age group of *D. viridis* and *D. temmincki* have high probability to come into contact with other year-round residents, especially *Rudarius ercodes*, which occur frequently in the catch and are predominant in the *Zostera* belt. These fishes tend to

BEHAVIOR (CONTINUED)

82-000804 CONTINUED reduce competition for the same food resources by means of different seasonal population fluctuation or segregation of microhabitat. The O+ age of *N. ransonneti* mainly use the *Zostera* belt as a spawning of nursery ground.

82-000805 Hueter, R. E. and S. H. Gruber. RECENT ADVANCES IN STUDIES OF THE VISUAL SYSTEM OF THE JUVENILE LEMON SHARK *(NEGAPRION BREVIROSTRIS). Fla. Sci.* 45(1):11-25. 1982. SFA 27(2)

[Dep. Zool., Univ. Fla., Gainesville 32611] Due to its phyletic position among the selachians, its relative abundance in Florida coastal waters, and its unusual adaptability to laboratory conditions, the juvenile lemon shark is an excellent model for studies of the sensory biology of the "typical" shark. Our investigations of the physiological optics of the shark's eye have resulted in a mathematical model, or schematic eye, for the species. This optical model is centered around an ellipsoidal lens of high overall equivalent refractive index (1.664) and principal power (140 diopters), and yet all data indicate these animals to be hypermetropic (far-sighted) by about 3 diopters underwater, with no evidence of accommodation. Using the schematic eye, optical limitations on spatial vision of this shark are predictable. In addition to discussing the optics, we breifly reiew recent findings on the anatomical and functional organization of the retina, as well as psychophysical measurements of absolute visual threshold, in the juvenile lemon shark.

82-000806 Kavaliers, M. SCHOOLING BEHAVIOR OF FISH: AN OPIATE-DEPENDENT ACTIVITY? *Behav. Neural Biol.* 33(4):397-401. Dec. 1981. SFA 27(2)

[Dep. Zool., Univ. West. Ontario, London, ON N6A 5B7, Canada] Intraventricular administration of the opioid peptide, β-endorphin (5.0 pg g^{-1} body weight) in goldfish significantly increases the cohesiveness and duration of schooling as well as decreasing the latency of school formation in response to external stimulation. Higher levels of β-endorphin (15.0 pg g^{-1}) decrease schooling behaviors. These endorphin effects could be blocked by prior systemic adminstration of naloxone, an opiate antagonist, supporting mediation of the effects of opioid receptors. Blockade of endogenous opiates by intraventricular injections of naloxone also decrease schooling abilities. These data suggest that endogenous opiate systems have a role in the regulation of schooling and social behaviors.

82-000807 Keyes, R. S. SHARKS: AN UNUSUAL EXAMPLE OF CLEANING SYMBIOSIS. *Copeia* 1982(1):225-227. 23 Feb. 1982. SFA 27(2)

[Sea World, Inc., 1720 South Shores Rd., San Diego, CA 92109]

82-000808 Kuenzer, P. ÄQUIVALENZKÄMPFE, VERHALTENSBEDINGTE UMFÄRBUNGEN UND SOZIALE ORGANISATION BEIM LÄNGSBANDSALMLER *NANNOSTOMUS BECKFORDI* (TELEOSTEI, LEBIASINIDAE). [UNDECIDED FIGHTS, BEHAVIOUR-INDUCED COLOUR CHANGE AND SOCIAL ORGANIZATION IN THE PENCILFISH *NANNOSTOMUS BECKFORDI* (TELEOSTEI, LEBIASINIDAE).] *J. Comp. Ethol.* 58(2):89-118. 1982. In German with English summ. SFA 27(2)

[Zool. Inst. Mus., Univ. Göttingen, West Germany]

82-000809 Leosch, J. G.; W. H. Kriete, Jr. and E. J. Foell. EFFECTS OF LIGHT INTENSITY ON THE CATCHABILITY OF JUVENILE ANADROMOUS *ALOSA* SPECIES. *Trans. Am. Fish. Soc.* 111(1):41-44. Jan. 1982. SFA 27(2)

[Va. Inst. Mar. Sci., Sch. Mar. Sci., Coll. William and Mary, Gloucester Point 23062]

BEHAVIOR (CONTINUED)

82-000810 Levine, J. S. and E. F. MacNichol, Jr. COLOR VISION IN FISHES. *Sci. Am.* 246(2):140-149. Feb. 1982. SFA 27(2)
[Dep. Biol., Boston Coll., Boston, MA]

82-000811 Liley, N. R. CHEMICAL COMMUNICATION IN FISH. *Can. J. Fish. Aquatic Sci.* 39(1):22-35. Jan. 1982. In English with French summ. SFA 27(2)
[Dep. Zool., Univ. British Columbia, Vancouver, BC V6T 2A9, Canada]

82-000812 MacCrimmon, H. R. and W. H. Robbins. INFLUENCE OF TEMPERATURE, WATER CURRENT, ILLUMINATION, AND TIME ON ACTIVITY AND SUBSTRATE SELECTION IN JUVENILE SMALLMOUTH BASS (*MICROPTERUS DOLOMIEUI*). *Can. J. Zool.* 59(12):2322-2330. Dec. 1981. In English with French summ. SFA 27(2)
[Dep. Zool., Univ. Guelph, Guelph, ON N1G 2W1, Canada] Behaviour of wild juvenile smallmouth bass, *Micropterus dolomieui*, in the laboratory was significantly influenced by water temperature, current, and illumination. Activity increased with increasing water temperature and (or) water current. When exposed to black and white substrate, selection of black was inversely dependent on temperature and current, and highly correlated with fish activity ($r = 0.995$, $P < 0.001$, inverse cubic relation). Substrate pattern influenced fish activity, aggregation, and social interaction. Activity levels increased with increasing incident illumination whereas selection of black substrate declined, particularly at higher water temperatures. Older juveniles became less active with age and preferred black substrate when available, thereby indicating a developing behavioural pattern which favours survival and energy conservation under natural nursery conditions by the discrete use of available cover.

82-000813 Okamoto, M.; O. Sato; T. Kuroki and T. Murai. [THE EFFECT OF DIVERS ON THE BEHAVIOR OF FISHES.] *Bull. Jpn. Soc. Sci. Fish.* 47(12):1567-1573. Dec. 1981. In Japanese with English summ. SFA 27(2)
[Fac. Fish., Hokkaido Univ., Minato, Hakodate 041, Japan] To elicit the effect of divers on the behavior of fishes, automatic underwater 16mm movie camera was prepared. At four artificial reefs, artificial seaweeds farm, concrete block reefs, stone reef and pearl farm, a movie camera was set on the sea floor for two successing days, at almost same time and the same place. On each day, movie was shot for about 30 minutes. On one day, no diver swam during shooting, and on the other day, a few divers investigated fish species and their amount around the camera. From the movies, number of fishes and fish species were analyzed. As the results, some phenomena concerning behavior of fishes were found to be as follows. (1) In the case of diving observation, most of the fishes made only slight escaping behavior and some fishes swam away quickly, when diver approached them. (2) When we compared the appearance rate of fishes on 16mm movie at manned condition and at unmanned condition, the former was 0.4-0.6 of the latter. (3) Number of fish species recognized from the movie was only 0.1-0.2 of the number of direct observation. So it was deduced that the direct observation of fishes living near artificial reefs to be very useful, even if the fault of changes on fish behavior could be seen.

82-000814 Pandey, K. and J. P. Shukla. BEHAVIOURAL STUDIES OF FRESHWATER FISHES DURING A SOLAR ECLIPSE. *Environ. Biol. Fishes* 7(1):63-64. 15 Jan. 1982. SFA 27(2)
[Dep. Zool., Univ. Gorakhpur, Gorakhpur 273001, U.P. India] Effects of a total eclipse on fish have rarely been recorded. Three freshwater fish species - *Amphipnous cuchia*, *Anabas testudineus* and *Colisa fasciata* were studied during the past total solar eclipse on February 16, 1980. Behavioural studies pertaining chiefly to fish movement, fish breathing and colouration were made, and possible reasons for effects are discussed.

BEHAVIOR (CONTINUED)

82-000815 Pesaro, M.; M. Balsamo; G. Gandolfi and P. Tongiorgi. DISCRIMINATION AMONG DIFFERENT KINDS OF WATER IN JUVENILE EELS, *ANGUILLA ANGUILLA* (L.). *Monit. Zool. It.* 15(3):183-191. 1981. In English with Italian summ. SFA 27(2)
[Ist. Zool., Univ. Parma, Italy]

82-000816 Pitts, P. A. and W. S. Alevizon. THE COMPARATIVE USE OF FOOD AND SPACE BY THREE BAHAMIAN BUTTERFLYFISHES. *Fla. Sci.* 45(suppl. 1):24. 1982. Abstract only. SFA 27(2)
[Fla. Inst. Technol., Melbourne 32901] The use of food and space resources were compared among three butterflyfishes (*Chaetodon capistratus, C. striatus,* and *C. ocellatus*) inhabiting the same general Bahamian coral reef environment. These fish showed significant differences in their distribution and abundance patterns. Two species, *C. striatus* and *C. ocellatus,* displayed an almost perfect inverse correlation in abundance among the five reef "zones" investigated. The diets of these two were found to overlap extensively. The third species, *C. capistratus,* was found to broadly overlap the other two species in its use of space resources, but showed distinct differences in its use of food resources. The data supports the traditional view that coral reef fishes tend to avoid or reduce competition by specializations which enable them to partition available food and space resources.

82-000817 Reynolds, W. W. and M. E. Casterlin. THERMOREGULATORY BEHAVIOUR, DIEL ACTIVITY AND THE RELATIONSHIP OF SPONTANEOUS LOCOMOTOR ACTIVITY TO TEMPERATURE IN THE SEA RAVEN, *HEMITRIPTERUS AMERICANUS (GMELIN). J. Fish Biol.* 20(1):1-4. Jan. 1982. SFA 27(2)
[Mar. Biol. Prog., Univ. New England, Biddeford, ME 04005] Twelve sea ravens, *Hemitripterus americanus,* were tested individually for three day periods in electronic shuttleboxes to measure their preferred and avoided temperatures, diel activity pattern and relationship of activity to temperature. The fish avoided temperatures below 9°C or above 25°C, preferring temperatures with a central tendency of 15-17°C. The fish were primarily nocturnal, being more active at night than by day. Locomotor activity increased eightfold between 10 and 20°C, but exhibited an anomalous decrease between 14 and 18°C, corresponding to the preferred-temperature zone, characteristic of maximal summer temperatures in the natural habitat.

82-000818 Risk, M. J. and P. W. Sammarco. BIOEROSION OF CORALS AND THE INFLUENCE OF DAMSELFISH TERRITORIALITY: A PRELIMINARY STUDY. *Oecologia (Berl.)* 52(3):376-380. Mar. 1982. SFA 27(2)
[Dep. Geol., McMaster Univ., Hamilton, ON L8S 4M1, Canada]

82-000819 Roitblat, H. L.; W. Tham and L. Golub. PERFORMANCE OF *BETTA SPLENDENS* IN A RADIAL ARM MAZE. *Anim. Learn. Behav.* 10(1):108-114. Feb. 1982. SFA 27(2)
[Columbia Univ., New York, NY 10027]

82-000820 Ross, M. J. and D. B. Siniff. TEMPERATURES SELECTED IN A POWER PLANT THERMAL EFFLUENT BY ADULT YELLOW PERCH (*PERCA FLAVESCENS*) IN WINTER. *Can. J. Fish. Aquatic Sci.* 39(2):346-349. Feb. 1982. In English with French summ. SFA 27(2)
[Dep. Ecol. Behav. Biol., Univ. Minn., Minneapolis 55455]

82-000821 Shpigel, M. NICHE ORVERLAP AMONG TWO SPECIES OF CORAL DWELLING FISHES OF THE GENUS *DASCYLLUS* (POMACENTRIDAE). *Environ. Biol. Fishes* 7(1):65-68. 15 Jan. 1982. SFA 27(2)

BEHAVIOR (CONTINUED)

82-000821 CONTINUED
[George S. Wise Fac. Life Sci., Dep. Zool., Tel Aviv Univ., Tel Aviv, Israel] The two damselfish, *Dascyllus aruanus* and *D. marginatus* are coral-dwelling species, occurring in separate groups or together in the corals *Stylophora pistillata* and *Acropora* spp. The two species, however, occur together more frequently than would be expected by chance. The niches of these species overlap in space, time and food. Looking for mechanisms that allow such coexistance, it was found that in such a bispecific group, no difference exists in agonistic acts between intra- or interspecific encounter. This phenomenon seems to be produced by two independent mechanisms - random settling of juveniles from the plankton and predation pressure that strongly limits the re-settling of the fish.

82-000822 Shrode, J. B.; K. E. Zerba and J. S. Stephens, Jr. ECOLOGICAL SIGNIFICANCE OF TEMPERATURE TOLERANCE AND PREFERENCE OF SOME INSHORE CALIFORNIA FISHES. *Trans. Am. Fish. Soc.* 111(1):45-51. Jan. 1982. SFA 27(2)
[Sch. For. Resour., Univ. Ga., Athens 30602]

82-000823 Tavolga, W. N. AUDITORY ACUITY IN THE SEA CATFISH (*ARIUS FELIS*). *J. Exp. Biol.* 96:367-376. Feb. 1982. SFA 27(2)
[Mote Mar. Lab., Sarasota, FL]

82-000824 Veen, T. van and M. Andersson. THRESHOLD FOR SYNCHRONIZATION OF LOCOMOTOR ACTIVITY TO VISIBLE RADIATION IN THE EEL *ANGUILLA ANGUILLA*. *Oikos* 38(1):21-26. Jan. 1982. SFA 27(2)
[Dep. Zool., Univ. Lund, Helgonav. 3, S-223 62 Lund, Sweden]

82-000825 Waldman, B. QUANTITATIVE AND DEVELOPMENTAL ANALYSIS OF THE ALARM REACTION IN THE ZEBRA DANIO, *BRACHYDANIO RERIO*. *Copeia* 1982(1):1-9. 23 Feb. 1982. SFA 27(2)
[Sect. Neurobiol. Behav., Cornell Univ., Langmuir Lab., Ithaca, NY 14850]

82-000826 Webb, P. W. FAST-START RESISTANCE OF TROUT. *J. Exp. Biol.* 96:93-106. Feb. 1982. SFA 27(2)
[Sch. Nat. Resour., Univ. Mich., Ann Arbor 48109]

82-000827 Whitman, R. P.; T. P. Quinn and E. L. Brannon. INFLUENCE OF SUSPENDED VOLCANIC ASH ON HOMING BEHAVIOR OF ADULT CHINOOK SALMON. *Trans. Am. Fish. Soc.* 111(1):63-69. Jan. 1982. SFA 27(2)
[Coll. Fish. WH-10, Univ. Wash., Seattle 98195]

82-000828 Yonemori, T. [DRAG MEASUREMENTS OF FISH BODY AND CALCULATIONS OF DRAG POWER.] *Bull. Jpn. Soc. Sci. Fish.* 47(10):1329-1334. In Japanese with English summ. SFA 27(2)
[Fac. Fish., Kagoshima Univ., Kagoshima 890, Japan]

82-000829 Yonemori, T. [EFFECTS OF WATER TEMPERATURE ON THE SWIMMING POWER OF FISHES.] *Bull. Jpn. Soc. Sci. Fish.* 47(10):1335-1339. In Japanese with English summ. SFA 27(2)
[Fac. Fish., Kagoshima Univ., Kagoshima 890, Japan]

LIFE HISTORY-GENERAL WORKS

82-000830 Biette, R. M.; D. P. Dodge; R. L. Hassinger and T. M. Stauffer. LIFE HISTORY AND TIMING OF MIGRATIONS AND SPAWNING BEHAVIOR OF RAINBOW TROUT (*SALMO GAIRDNERI*) POPULATIONS OF THE GREAT LAKES. *Can. J. Fish. Aquatic Sci.* 38(12):1759-1771. Dec. 1981. In English with French summ. SFA 27(2)
[Ontario Minist. Nat. Resour., Fish. Br., Queen's Park, Toronto, ON M7A 1W5, Canada]

82-000831 Binns, N. A. BONNEVILLE CUTTHROAT TROUT *SALMO CLARKI UTAH* IN WYOMING. *Wyo. Game Fish. Dep. Fish. Tech. Bull.* No. 5. vi + 107p. 1981. Available from Wyo. Game Fish Dep., Cheyenne. SFA 27(2)

82-000832 Burr, B. M. and R. L. Mayden. LIFE HISTORY OF THE BRINDLED MADTOM *NOTURUS MIURUS* IN MILL CREEK, ILLINOIS (PISCES: ICTALURIDAE). *Am. Midl. Nat.* 107(1):25-41. Jan. 1982. SFA 27(2)
[Dep. Zool. South Ill. Univ., Carbondale 62901] The life history of *Noturus miurus* was studied from collections made at Mill Creek, Pulaski Co., Illinois, between 27 August 1978 and 27 October 1979. A total of 318 specimens ranging in age from 1-36 months were collected and six nests with guardian males were found. *Noturus miurus* is syntopic with *N. nocturnus* in Mill Creek; *N. miurus* usually occupied mud-bottom, debris-ridden pools and *N. nocturnus* generally inhabited rocky or brushy riffles. Males were sexually mature at 2 years, and during the breeding season their heads, lips and genital papillae were swollen. Females had mature ova from May to July; some females reached sexual maturity by 1 year. The number of mature oocytes produced by a female ranged from 42-90($\bar{x}$ = 66.2). The nesting season spanned at least 19-28 June 1979 when water temperatures ranged from 24-27 C. Six nests, each containing a single clutch of eggs and each guarded by a single male, were found in 355-ml beer cans and under flat rocks in quiet pools. Clutch size ranged from 56-81($\bar{x}$ = 66.2); eggs were spherical and yellow or amber in color and ranged in size from 3.4-3.8 mm ($\bar{x}$ = 3.5). Clutches of eggs incubated in the laboratory at 25 C hatched in 189 to 215 hr with a hatching success of 86%. Individual *Noturus miurus* grew at a decreasing rate in standard length and at a constant rate in body weight for a least 3 years. One-half of the 1st year's mean growth in length was reached in ca. 8 weeks; about 10 months was required to attain one-half of the 1st year's mean weight. The largest fish collected at Mill Creek was 79 mm. Aquatic dipteran larvae and pupae, ephemeropteran naiads, trichopteran larvae and adult isopods were the predominant food items in the 107 stomachs examined. Diversity of diet tended to increase with increasing size. *Noturus miurus* was frequently parasitized by nematodes and less frequently by flukes and parasitic copepods.

82-000833 Díaz-Machuca, J. L. BIOLOGY OF THE ICTALURIDS IN THE VICENTE GUERRERO RESERVOIR (LAS ADJUNTAS), TAMAULIPAS, MEXICO. *Proc. Desert Fishes Counc.* 12:81-82. 1980(1981). In English and Spanish. Abstract only. SFA 27(2)
[Lab. Ictiol. Pesq., Fac. Cienc. Biol., Univ. Autónoma, Nuevo Leon, Mexico]

82-000834 Gruber, S. H. and L. J. V. Compagno. TAXONOMIC STATUS AND BIOLOGY OF THE BIGEYE THRESHER, *ALOPIAS SUPERCILIOSUS*. *NOAA Fish. Bull.* 79(4):617-640. Oct. 1981. SFA 27(2)
[Rosenstiel Sch. Mar. Atmos. Sci., Univ. Miami, 4600 Rickenbacker Causeway, Miami, FL 33149]

LIFE HISTORY-GENERAL WORKS (CONTINUED)

82-000835 Haas, R. NOTES ON THE ECOLOGY OF *APHANIUS DISPAR* (PISCES, CYPRINODONTIDAE) IN THE SULTANATE OF OMAN. *Freshwater Biol.* 12(1):89-95. Feb. 1982. SFA 27(2)
[Dep. Biol., Calif. State Univ., Fresno 93740] *Aphanius dispar* was observed in the field and some simple laboratory studies were undertaken in Oman. *A. dispar* is almost totally ubiquitous in all bodies of fresh water where it occupies a wide range of habitats differing in stream flow, water chemistry, temperature and substrate quality. It often is found in association with one or both of two cyprinid fishes, *Cyprinion* and *Garra*. *Aphanius* is tolerant of wide ranges of salinity up to full marine water and has a wide temperature range. *A. dispar* resembles *Cyprinodon* species in a number of particulars, probably reflecting phylogenetic relationships and a common evolutionary response to desert conditions. It breeds throughout the year with a probable peak in the months of April to June.

82-000836 Hubbs, C. LIFE HISTORY DYNAMICS OF *MENIDIA BERYLLINA* FROM LAKE TEXOMA. *Am. Midl. Nat.* 107(1):1-12. Jan. 1982. SFA 27(2)
[Dep. Zool., Univ. Tex., Austin 78712] Life history calculations for Lake Texoma *Menidia beryllina* (Cope) show that female fecundity is size-dependent with egg numbers ranging up to ca. 2000 eggs per female per day of a 3-month breeding period. During that time female growth cannot be demonstrated and extensive mortality results in virtually no adults surviving to spawn a 2nd year. Growth is density-dependent and reproduction can occur if young-of-the-year achieve minimum spawning size before water temperatures exceed the maximum breeding limit of ca. 30C.

82-000837 Ihssen, P. E.; D. O. Evans; W. J. Christie; J. A. Reckahn and R. L. DesJardine. LIFE HISTORY, MORPHOLOGY, AND ELECTROPHORETIC CHARACTERISTICS OF FIVE ALLOPATRIC STOCKS OF LAKE WHITEFISH (*COREGONUS CLUPEAFORMIS*) IN THE GREAT LAKES REGION. *Can. J. Fish. Aquatic Sci.* 38(12):1790-1807. Dec. 1981. In English with French summ. SFA 27(2)
[Ontario Minist. Nat. Resour., Res. Sect., Fish. Br., Maple, ON L0J 1E0, Canada]

82-000838 Kanno, Y. [ON THE LIFE HISTORY OF HERRING, *CULPEA PALLASII* CUVIER ET VALENCIENNES, IN THE BRACKISH LAKE NOTORO, HOKKAIDO. III. REPRODUCTIVE CHARACTERISTICS AND FEEDING HABITS.] *Bull. Fac. Fish. Hokkaido Univ.* 32(4):316-328. Nov. 1981. In Japanese with English summ. SFA 27(2)
[Lab. Biol. Fish Popul., Fac. Fish., Hokkaido Univ., Hokodate, Japan]

82-000839 Levy, D. A. and T. G. Northcote. JUVENILE SALMON RESIDENCY IN A MARSH AREA OF THE FRASER RIVER ESTUARY. *Can. J. Fish. Aquatic Sci.* 39(2):270-276. Feb. 1982. In English with French summ. SFA 27(2)
[Westwater Res. Cent., Univ. British Columbia, 2075 Wesbrook Mall, Vancouver, BC V6T 1W5, Canada]

82-000840 Lewis, D. S. C. PRELIMINARY COMPARISONS BETWEEN THE ECOLOGY OF THE HAPLOCHROMINE CICHLID FISHES OF LAKE VICTORIA AND LAKE MALAWI. *Neth. J. Zool.* 31(4):746-761. Dec. 1981. SFA 27(2)
[Minist. For. Nat. Resour., Fish. Dep., Fish Res. Stn., Malawi]

82-000841 McBride, F. T.; R. I. Jones and F. A. Harris. GROWTH RATES AND FOOD HABITS OF ROANOKE BASS IN THE ENO AND TAR RIVERS, NORTH CAROLINA. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:341-348. 1980[1981]. SFA 27(2)
[Div. Inland Fish., N.C. Wildl. Resour. Comm., Raleigh 27611] Two hundred and thirty Roanoke bass (*Ambloplites cavifrons*) were collected from the

LIFE HISTORY-GENERAL WORKS (CONTINUED)

82-000841 CONTINUED Tar and Eno rivers in Piedmont, North Carolina. Seven age groups (1 to 7) were collected from the Tar River and 5 age groups (1 to 5) were collected from the Eno River. Mean back-calculated total lengths were similar in both rivers. Five-year old fish from the Tar River averaged 246mm and from the Eno River 243mm. Roanoke bass were generally opportunistic feeders, but larger individuals selectively fed on crayfish (*Cambarus* sp.) and fish. Feeding appeared to be concentrated in vegetated riffle areas.

82-000842 Medel-Ulmer, L. MOVEMENT AND REPRODUCTION OF THE RAZORBACK SUCKER (*XYRAUCHEN TEXANUS*) INHABITING SENATOR WASH RESERVOIR, IMPERIAL COUNTY, CALIFORNIA. *Proc. Desert Fishes Counc.* 12:106. 1980(1981). Abstract only. SFA 27(2)
[Calif. State Univ., Long Beach 90840]

82-000843 Power, G. STOCK CHARACTERISTICS AND CATCHES OF ATLANTIC SALMON (*SALMO SALAR*) IN QUEBEC, AND NEWFOUNDLAND AND LABRADOR IN RELATION TO ENVIRONMENTAL VARIABLES. *Can. J. Fish. Aquatic Sci.* 38(12):1601-1611. Dec. 1981. In English with French summ. SFA 27(2)
[Dep. Biol., Univ. Waterloo, Waterloo, ON N2L 3G1, Canada]

82-000844 Rinne, W. E. ASPECTS OF THE LIFE HISTORY AND DISTRIBUTION OF THE VIRGIN SPINEDACE (*LEPIDOMEDA MOLLISPINIS*). *Proc. Desert Fishes Counc.* 12:119-122. 1980(1981). In English and Spanish. Abstract only. SFA 27(2)
[Water Power Resour. Serv., Boulder City, NV] The Virgin Spinedace (*Lepidomeda mollispinis*) is a member of a unique, endemic tribe, the Plagopterini, of the western cyprinids. Prior to 1960 little was written on the classification, distribution or biology of this species (Miller and Hubbs, 1960). This paper reports the results of field and laboratory investigations on the Virgin Spinedace from October 1969 through March 1971. Discussion is also presented on changes in distribution and relative abundance as determined by this study when compared to results of a study by Cross (1975) from June 1973 through March 1975. Spinedace prefer clean, cool, moderately swift streams of relatively shallow depth. Insect material is the preferred food and plant material is utilized only when insect availability is low. Spawning occurs once each year, lasting from spring through early summer. The majority of spawners in the population during this study were Age Group I fish. Some Age Group III fish may spawn twice during a spawning season as demonstrated by fecundity studies. Maturation of gonads appears to be regulated in part by increasing water temperature, discharge and photoperiod. The majority of the population in the study area were Age Group 0 or Age Group I fish. Females appeared to live longer than males and dominate Age Group II and III collections. Distribution was found to be similar to apparent historic distribution but population reduction has occurred because of loss of habitat and competition and predation from introduced exotics. Spinedace populations have declined in the Virgin River since the 1930's. At present, small intact populations exist near the mouth of Beaver Dam Creek, the north and lower east fork of the Virgin River in Zion National Park, and portion of the Santa Clara River and its tributaries (Cross 1975). The continued decline in distribution and abundance of spinedace as demonstrated by Rinne (1971) and Cross (1975) signal the need for a closer review of the status of this species.

82-000845 Rosen, R. A.; D. C. Hales and D. G. Unkenholz.. BIOLOGY AND EXPLOITATION OF PADDLEFISH IN THE MISSOURI RIVER BELOW GAVINS POINT DAM. *Trans. Am. Fish. Soc.* 111(2):216-222. Mar. 1982. SFA 27(2)
[Natl. Wildl. Fed., 1412 16th St., NW, Washington, DC 20036]

LIFE HISTORY-GENERAL WORKS (CONTINUED)

82-000846 Shafi, M. and B. M. Jasim. SOME ASPECTS OF THE BIOLOGY OF A CYPRINID, *ASPIUS VORAX* HECKEL. *J. Fish Biol.* 20(3):271-278. Mar. 1982. SFA 27(2)

[Nat. Hist. Res. Cent., Univ. Baghdad, Iraq] Scales were used for the determination of age with back-calculation of length. The oldest fish was VII+ years old. Back-calculation did not exhibit Lee's phenomenon. The most rapid growth occurred in summer at water temperautres over 25°C. The growth in weight was *c.*33lg year^{-1} after IV years of life. Growth was well described by von Bertalanffy equation: l_t-91.0[l=$^{0\cdot122(t-0\cdot25)}$]. The length-weight relationship followed the cube law (b=3.0601) K_n ranged from 0.74 to 1.18 with a mean value of 1.0. Spawning occurred in January, fecundity was 74 509 with a mean of 1157 eggs g^{-1} body weight. Mean diameter of eggs was 1071 (µm). A developed ovary had ova of two sizes, immature oocytes and mature ova. The fish is a carnivorous feeder.

82-000847 Shlossman, P. A. and M. E. Chittenden, Jr. REPRODUCTION, MOVEMENTS, AND POPULATION DYNAMICS OF THE SAND SEATROUT, *CYNOSCION ARENARIUS*. *NOAA Fish. Bull.* 79(4):649-669. Oct. 1981. SFA 27(2)

[Dep. Wildl. Fish. Sci., Tex. A&M Univ., College Station 77843] *Cynoscion arenarius* females mature at 140-180 mm total length as they approach age I. Spawning occurs from early March through September, but concentrates in a distinct spring period (March-May) and a distinct late summer period (August-September). Spawning occurs in the inshore Gulf of Mexico and coincoides with the periodicity of onshore winds and surface currents which probably transport eggs or larvae to estuarine and inshore gulf nurseries. Estuarine nurseries may be most important to late summer spawned groups. The main gulf nursery in the northwestern area is in waters shallower than 18m. Both spawned groups leave estuarine nurseries in fall to overwinter in the gulf. Late summer spawned groups return to estuaries in midspring but reenter the gulf in August to spawn. Fish average 210-280 mm total length at age I but some were 300 mm. Predicted sizes of late summer fish were 425 mm total length at age II and 574 mm at age III. The largest trawled specimen was 342 mm total length and 99.5% were less than 280 mm. No more than three spawned groups or two year classes occurred at any one time. The typical maximum lifespan is 1-2 years based on trawl data and possibly as much as 2-3 years for other gear. Total annual mortality rate was 99.79% based on trawling data and appears no lower than 80-90% if maximum lifespan typically is as great as 3 years. *Cynoscion arenarius* can be aged using scales. Total weight-total length, girth-total length, and standard length-total length regressions are presented. Temporal isolation of the two spawned groups produced each year suggests they may be separate populations or species. The life history and population dynamics of *C. arenarius* appear similar to *C. regalis* along the Atlantic coast south of Cape Hatteras, North Carolina. The latter taxon shows zoogeographic change at Cape Hatteras, which needs management consideration.

82-000848 Snelson, F. F., Jr. and T. J. Mulligan. BIOLOGY OF THE BULL SHARK IN THE INDIAN RIVER LAGOON, FLORIDA. *Fla. Sci.* 45(suppl. 1):27. 1982. Abstract only. SFA 27(2)

[Dep. Biol. Sci., Univ. Cent. Fla., Orlando 32816] The bull shark, *Carcharhinus leucas*, is the most common shark in the brackish Indian River lagoon system on the central east coast of Florida. The biology of the lagoon population was studied between May 1975 and May 1979. Pregnant females, 240-265 cm long, move into the lagoons in the spring and early summer and give birth in June and July to young that average about 75 cm long. The females leave the lagoons after parturition. Young and juvenile sharks stay in the lagoons for about 3 years, until they are 180-200 cm long. There may be some emigration from the lagoons in winter, especially in yearlings. Subadult sharks leave the lagoons permanently as they begin to mature, and join the population of adults that apparently resides in deeper offshore waters. Juvenile bull sharks in the lagoon system feed primarily on stingrays and marine catfishes.

LIFE HISTORY-GENERAL WORKS (CONTINUED)

82-000849 Snyder, W. S. GROWTH AND MORTALITY OF LARVAL FRESHWATER DRUM (*APLODINOTUS GRUNNIENS*) IN THE MAUMEE RIVER ESTUARY. *Ohio J. Sci.* 82(2):8-9. 1982. Abstract only. SFA 27(2)

[Cent. Lake Erie Area Res., Ohio State Univ., 484 W. 12th Ave., Columbus 43210] Cumulative catch curve analysis was used in the determination of instantaneous growth and mortality rates for larval freshwater drum (*Aplodinotus grunniens*) in the lower Maumee River. Collections made at two sampling ranges indicated that two hatches had occurred during the 1977 spawn. Ichthyoplankton populations were significantly affected by currents within the lower river, which is noted as being a freshwater estuary. Growth rates (G) calculated ranged from .03-.09. Mortality (Z) rates ranged from -.11 to -.33.

82-000850 Stephens, R. T. T. REPRODUCTION, GROWTH AND MORTALITY OF THE COMMON BULLY, *GOBIOMORPHUS COTIDIANUS* MCDOWALL, IN A EUTROPHIC NEW ZEALAND LAKE. *J. Fish Biol.* 20(3):259-270. Mar. 1982. SFA 27(2)

[Sch. Sci., Univ. Waikato, Hamilton, New Zealand] *Gobiomorphus cotidianus* in Lake Waahi, North Island, New Zealand, (37° 34' S; 175° 08' E) spawned continuously between July 1976 and March 1977. Length frequency data indicated that two, and briefly, three year classes, were present, each made up of three groups which were the progeny from successive peaks in spawning activity. Scale examination revealed checks to growth associated with spawning and stressful midsummer conditions. These and length frequency data were used in growth estimates which indicated that bullies reached 3.5-4.0 cm after their first year, 5-6 cm after their second but did not survive a third year. Mortality was associated with spawning and midsummer stress.

82-000851 Surat, E. M.; W. J. Matthews and J. R. Bek. COMPARATIVE ECOLOGY OF *NOTROPIS ALBEOLUS*, *N. ARDENS* AND *N. CERASINUS* (CYPRINIDAE) IN THE UPPER ROANOKE RIVER DRAINAGE, VIRGINIA. *Am. Midl. Nat.* 107(1):13-24. Jan. 1982. SFA 27(2)

[W. J. Matthews: Dep. Biol., Univ. Okla., Kingston 73439] Foods, feeding periodicity and microhabitat use are reported for coexisting *Notropis albeolus*, *N. ardens* and *N. cerasinus* in the upper Roanoke River drainage, Virginia. All three species primarily occupied pool habitats, ate aquatic insect larvae or terrestrial adult insects, and were diurnal feeders. *Notropis ardens* (subgenus *Lythrurus*) was ecologically segregated from *N. albeolus* and *N. cerasinus* (both subgenus *Luxilus*) in vertical spacing in the water column and in taxa of foods used. The two *Luxilus* species were ecologically more similar, segregated only by vertical differences in microhabitat. Overlaps in resource use among the three species pairs suggested congruence of phylogenetic and ecological similarities.

82-000852 Vigg, S. and P. A. Kucera. CONTRIBUTIONS TO THE LIFE HISTORY OF SACRAMENTO PERCH, *ARCHOPLITES INTERRUPTUS*, IN PYRAMID LAKE, NEVADA. *Great Basin Nat.* 41(3):278-289. 30 Sept. 1981. SFA 27(2)

[Bioresour. Cent., Desert Res. Inst., Reno, NV 89506] During a two-year period (1976-1977), 180 Sacramento perch (*Archoplites interruptus*) were sampled from Pyramid Lake, Nevada, on a monthly basis using several capture methods in all lake areas. Age and growth determinations of these fish were inconsistent with previous research on this species. Sacramento perch are entirely carnivorous, adults feeding primarily on tui chub (*Gila bicolor*). Fish accounted for 6 percent of the diet (by volume) of Sacramento perch less than 300 mm fork length, and 98 percent for those exceeding 300 mm. Amphipods, Odonata, and Chironomidae composed 6.3, 5.7, and 1.8 percent, respectively, of the stomach contents by volume for all sizes combined. Females spawned from June to August when water temperatures approached 20 C, and their gonad weight was about 6 percent of the total body

LIFE HISTORY-GENERAL WORKS (CONTINUED)

82-000852 CONTINUED weight. A sample of 20 female perch had a mean fecundity of 84,203 eggs. The mean diameter of mature eggs was 0.88 mm. Sacramento perch almost exclusively inhabit the littoral zone of Pyramid Lake. Activity, as indicated by net catches, was greatest during the warm months of May to October. Monthly catches were significantly correlated with temperature ($r=0.577$, $P<0.01$). No short-term changes in population abundances were observed during 1976-1977.

82-000853 Ware, D. M. POWER AND EVOLUTION FITNESS OF TELEOSTS. *Can. J. Fish. Aquatic Sci.* 39(1):3-13. Jan. 1982. In English with French summ. SFA 27(2)
[Dep. Fish. Oceans, Resour. Serv. Br., Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC.

82-000854 Archibald, C. P.; W. Shaw and B. M. Leaman. GROWTH AND MORTALITY ESTIMATES OF ROCKFISHES (SCORPAENIDAE) FROM B.C. COASTAL WATERS, 1977-1979. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1048. iv + 57p. Dec. 1981. In English with French summ. SFA 27(2)
[Dep. Fish. Oceans, Resour. Serv. Br., Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada] Estimated parameters of total and natural instantaneous mortality, as well as von Bertalanffy growth parameters are presented for 10 species of rockfish (genus *Sebastes*) from British Columbia coastal waters. These estimates were derived from analysis of ageing data obtained through the application of new ageing techniques. The estimated longevity of species in this genus increased considerably (up to 80+y) as a result of this work. Concomitantly, estimates of instantaneous mortality were reduced substantially (_50%) from previously published estimates. For unexploited or lightly exploited stocks estimates of Z ranged from 0.01-0.07, while for heavily exploited stocks the corresponding estimates ranged 0.09-0.18. Estimated parameters of growth changed relatively little from published values, largely because increased longevity occurs after major inflections in linear growth. Von Bertalanffy growth parameters presented here do not describe growth throughout life due to the lack of younger fish in the data set. The extension of age compositions past the point of major decreases in linear growth implies that the use of age-length keys for rockfishes, in British Columbia waters at least, is invalid.

82-000855 Aro, E. and V. Sjöblom. THE ABUNDANCE OF COD IN THE SEAS AROUND FINLAND IN 1974-80. *Int. Counc. Explor. Sea* C.M. 1981/J:20. 14p. 1981. In English with French summ. SFA 27(2)
[Finnish Game Fish. Res. Inst., P.O. Box 193, SF-00131 Helsinki 13, Finland]

82-000856 Aro, E.; V. Sjöblom; P. Suuronen and R. Parmanne. THE ABUNDANCE OF BALTIC HERRING AND SPRAT IN THE SEAS AROUND FINLAND IN 1979 AND 1980 ACCORDING TO ECHO COUNTING. *Int. Counc. Explor. Sea* C.M. 1981/J:21. 18p. 1981. In English with French summ. SFA 27(2)
[Finnish Game Fish. Res. Inst., P.O. Box 193, SF-00131 Helsinki 13, Finland]

82-000857 Clayton, J. W. THE STOCK CONCEPT AND THE UNCOUPLING OF ORGANISMAL AND MOLECULAR EVOLUTION. *Can. J. Fish. Aquatic Sci.* 38(12):1515-1522. Dec. 1981. In English with French summ. SFA 27(2)

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

82-000857 CONTINUED
[Dep. Fish. Oceans, Freshwater Inst., 501 University Crescent, Winnipeg, MB R3T 2N6, Canada]

82-000858 Coombs, C. and C. E. Bond. STATUS OF THE WARNER SUCKER (*CATOSTOMUS WARNERENSIS*). *Proc. Desert Fishes Counc.* 12:76. 1980(1981). Abstract only. SFA 27(2)
[Oreg. State Univ., Corvallis] The Warner sucker, once abundant in the Warner Valley, was reduced to remnant populations following development of irrigation systems in the valley. Diversion dams and ditches disrupted natural waterways, preventing access to spawning grounds and diverting fish down irrigation ditches. Although rare 20 years ago and not numerous now the species retains a wide distribution in the valley and at least 4 separate spawning populations so that single deleterious events should not wipe out all spawners. The life span is at least 9 years and maturity is reached in 3 years so that each year class has a long reproductive life. The greatest threat to the species is irrigation structures and artificial waterways, but the introduction of centrarchids and ictalurids constitutes a threat. We recommend that the species be listed as threatened, that additional study on distribution be done, that critical habitat be identified and protected, and that laws and regulations governing water use and fish life be enforced.

82-000859 Guillory, V. and R. Bejarano. EVALUATION OF JUVENILE MENHADEN ABUNDANCE DATA FOR PREDICTION OF COMMERCIAL HARVEST. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:193-203. 1980[1981]. SFA 27(2)
[La. Dep. Wildl. Fish., Mar. Res. Lab., Grand Isle 70358] Juvenile gulf menhaden (*Brevoortia patronus*) data were extracted from otter trawl surveys conducted along the Louisiana coast since 1966. The relationships between various abundance indexes and commercial harvest of age-1 fish were determined by correlation and linear regression analyses. Several indexes were significantly correlated at the 0.95 and 0.99 level with commercial harvest. The strongest indexes, involving frequency of occurrence of more than 25 or 50 gulf menhaden in samples, were used to predict commercial landings. Recommendations were made to continue monitoring the relationship between these abundance indexes and commercial harvest.

82-000860 Halling, F. and J. Salmi. ABUNDANCE, GROWTH AND MORTALITY OF AUTUMN-SPAWNING BALTIC HERRING LARVAE OFF THE COAST OF FINLAND. *Int. Counc. Explor. Sea.* C.M. 1981/J:22. 15p. 1981. In English with French summ. SFA 27(2)
[Finnish Game Fish. Res. Inst. Åland Isl. Field Stn., Öhbergsvæagen 1, SF-22100 Marieham, Finland]

82-000861 Hanson, J. M. and W. C. Leggett. EMPIRICAL PREDICTION OF FISH BIOMASS AND YIELD. *Can. J. Fish. Aquatic Sci.* 39(2):257-263. Feb. 1982. In English with French summ. SFA 27(2)
[Dep. Biol., McGill Univ., 1205 Ave. Docteur Penfield, Montreal, PQ H3A 1B1, Canada]

82-000862 Harvey, G. and R. Fortin. REPRODUCTION ET DYNAMIQUE DE POPULATION DE LA BARBOTTE BRUNE *ICTALURUS NEBULOSUS* (LE SUEUR) DANS LA FRAYÈRE DE LA RIVIÈRE AUX PINS, FLEUVE SAINT-LAURENT, PRÈS DE MONTRÉAL, QUÉBEC. [REPRODUCTION AND POPULATION DYNAMICS OF BROWN BULLHEADS *ICTALURUS NEBULOSUS* (LE SUEUR) ON THE SPAWNING GROUNDS ON THE RIVIÈRE AUX PINS, ST. LAWRENCE RIVER, NEAR MONTREAL (QUEBEC).] *Can. J. Zool.* 60(1):31-39. Jan. 1982. In French with English summ. SFA 27(2)
[Serv. Amenage. Exploitation Faune, Minist. Loisir, Chasse Pêche, Jonquière, PQ G7X 8L6, Canada]

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

82-000863 Horrall, R. M. BEHAVIORAL STOCK-ISOLATING MECHANISMS IN GREAT LAKES FISHES WITH SPECIAL REFERENCE TO HOMING AND SITE IMPRINTING. *Can. J. Fish. Aquatic Sci.* 38(12):1481-1496. Dec. 1981. In English with French summ. SFA 27(2)
[Mar. Stud. Cent., Univ. Wis., Madison 53706]

82-000864 Iles, T. D. and M. Sinclair. ATLANTIC HERRING: STOCK DISCRETENESS AND ABUNDANCE. *Science* 215(4533):627-633. 5 Feb. 1982. SFA 27(2)
[Bedford Inst. Oceanogr., P.O. Box 1006, Dartmouth, NS B2Y 4A2, Canada] The number of genetically distinct herring stocks is determined by the number of distinct, geographically stable larval retention areas. Spawning sites in these areas may be highly localized or dispersed. Absolute population size mostly depends on the retention area available to the density-dependent larval-postlarval stage. Although the extreme seasonal range of spawning time shown by Atlantic herrings is not fully accounted for by a new hypothesis, current theory is not supported by the hypothesis or by empirical data. The management implications are discussed.

82-000865 Jensen, A. L. EXPLOITATION AND EXPECTED NUMBER OF SPAWNINGS OF LAKE WHITEFISH *COREGONUS CLUPEAFORMIS*. *Oikos* 38(2):250-252. Mar. 1982. In English with Russian summ. SFA 27(2)
[Sch. Nat. Resour., Univ. Mich., Ann Arbor 48109] Exploited lake whitefish (*Coregonus clupeaformis*) populations often collapse, apparently as a result of recruitment failure. The expected number of spawnings per recruit could be an important variable for assessment of these stocks. In this study an equation is developed for calculation of the expected number of spawnings per recruit as a function of fishing mortality and age at vulnerability to the fishing gear. The exploitation of this population has resulted in an expected number of spawnings per recruit of near zero.

82-000866 Jester, D. B. and R. R. Suminski. AGE AND GROWTH, FECUNDITY, ABUNDANCE, AND BIOMASS PRODUCTION OF THE WHITE SANDS PUPFISH, *CYPRINODON TULAROSA* (CYPRINODONTIDAE), IN A DESERT POND. *Southwest. Nat.* 27(1):43-54. 19 Feb. 1982. SFA 27(2)
[Div. Nat. Sci. Math., Northeast. State Univ., Tahlequah, OK 74464] The White Sands pupfish (*Cyprinodon tularosa*) was introduced into a 0.1-ha, shallow, saline, eutrophic desert pond in the Tularosa Basin, New Mexico, in 1973. Life history investigations and a populaton estimate were made in 1975 and 1976. Maximum longevity of the pup-fish was 5 years, at which age they were 56.2 mm total length and weighed 3.4 g. The length-weight relationship was log W=-5.25601 + 3.30845 log L. Weight of fish when each annulus formed was computed. Mean fecundity ranged from 810 ova per female in Age Group I to 2,996 in Age Group IV, with a grand mean of 1,140. A Schnabel estimate of 12,520 trappable-size fish was expanded to form a survival curve described by log S = 3.74658 - 5.99959 log A, which showed that the population varied from 1,950,583 to 30,527 during the year. Mean standing crop biomass was 13.344 kg. The population and length-weight curves were integrated to compute estimates of live-weight biomass production of White Sands pupfish in each age group during 0.1-yr intervals. Total annual somatic production was 25.309 kg. Ratio of production to standing crop biomass was 1.90 or 190%. Production of 2.448 kg of eggs was estimated separately. Production rates of 25.3 $g/m^2/yr$ of somatic tissue, 2.5 $g/m^2/yr$ of eggs, and 27.8 $g/m^2/yr$ of total production are relatively high among fish at trophic level A_3. Fish in Age Group 0 accounted for 91.6% of the live-weight biomass produced and Age Group I accounted for 8%. A high rate of total production, extremely high rates of production by the youngest age groups, and a large ratio of production to standing crop biomass indicate that the population was below carrying capacity and was expanding.

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

82-000867 McDonald, M. E.; B. E. Cuker and S. C. Mozley. DISTRIBUTION, PRODUCTION, AND AGE STRUCTURE OF SLIMY SCULPIN IN AN ARCTIC LAKE. *Environ. Biol. Fishes* 7(2):171-176. 15 Mar. 1982. SFA 27(2)

[Zool. Dep., N.C. State Univ., Raleigh 27650] Slimy sculpins (*Cottus cognatus*) were caught in the littoral region of Toolik Lake, an arctic lake. These sculpins grew slower and lived longer (71 mm at 8+ years) than more southerly populations. Sculpin distribution along the slope of the rocky littoral zone was greatest at the 3.5 m depth and coincided with the rock-mud interface. The hypothesis that this 'preferred' area provided both increased prey and reduced predation was advanced. Yearly production estimate of littoral sculpins was 0.40 g $\cdot$ m^{-2} $\cdot$ yr^{-1} with a P/B ratio of 0.36. This is considerably less than estimates for more southerly populations of the same species.

82-000868 Methot, R. D., Jr. GROWTH RATES AND AGE DISTRIBUTIONS OF LARVAL AND JUVENILE NORTHERN ANCHOVY, *ENGRAULIS MORDAX*, WITH INFERENCES ON LARVAL SURVIVAL. *Ph.D. dissertation, Univ. Calif. (San Diego)* 328p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(7):2651. Jan. 1982. SFA 27(2)

Variation in the high mortality of marine fish larvae may be a major cause of fluctuations in abundance of adult fish stocks. It has often been suggested that variation in mortality occurs because of the dependence of larval survival on high concentrations of suitable prey. My studies on age and growth improve the precision of larval mortality estimates, introduce a new measure of larval survival, and indicate the incidence of malnourished larvae in the sea. Daily increments in otoliths of larval and juvenile northern anchovy, *Engraulis mordax*, were counted and measured. Growth rates were estimated from the relation between age and body size and from the width of the increments. Growth from 4.3mm standard length, the size at yolk absorption, to about 23mm was expressed using the Gompertz growth equation with maximum growth rate occurring at a size of 10mm. The growth of larvae estimated from the width of recently deposited increments was similar to growth estimated from the relation between size and age. These two estimates of mean growth would have differed if mortality rate had been correlated with growth rate. Growth rate at 10mm varied sesonally: 0.43mm/day in January to 0.7mm/day in August. In each season mean growth was similar to the growth of *ad libitum* fed larvae in the laboratory at the seasonal temperatures. Within season, variance in growth was small and not correlated with temperature. I conclude that early larvae typically obtain an adequate ration. Late larvae (23-40mm) typically grew 0.30-0.35mm/day. Growth increased at 40mm to 0.4-0.6mm/day. Engraulids typically complete transformation at aobut 40mm and are soon capable of filter feeding. Growth of juveniles larger than 60mm was about 0.3mm/day during the late summer but declined to 0.1mm/day for December. Juveniles are capable of more rapid growth in the laboratory. The potential for density dependent growth of juveniles is considered. Significant spawning in 1978 and 1979 occurred from December to May and peaked in March. The ages of juveniles collected in autumn of 1978 and 1979 indicated that neither yearclass was dominated by individuals born during a short period of the spawning season but March was the commonest month of birth. Comparison of the birthdate distributions to the respective spawning distributions indicates that larval survival was similar in the first half of each spawning season but was greater in April to May of the 1978 season than the same period of 1979. This difference in seasonal survival in nearly sufficient to account for the two-fold greater recruitment in 1978 and 1979. The seasonal patterns of survival through the larval state were not related to larval growth or mortality during the early larval stage but were consistent with changes in offshore drift inferred from monthly upwelling indices.

82-000869 Parmanne, R. and V. Sjöblom. ABUNDANCE, MORTALITY AND PRODUCTION OF SPRING-SPAWNING BALTIC HERRING LARVAE IN THE SEAS AROUND FINLAND IN 1980. *Int. Counc. Explor. Sea.* C.M. 1981/J:23. 15p. 1981. In English with French summ. SFA 27(2)

[Finnish Game Fish. Res. Inst., Fish. Div., P.O. Box 193, SF-00131 Helsinki 13, Finland]

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

82-000870 Parmanne, R. and V. Sjöblom. ABUNDANCE OF SPRAT EGGS AND LARVAE IN THE NORTHERN BALTIC IN 1980. *Int. Counc. Explor. Sea.* C.M. 1981/J:24. 7p. 1981. In English with French summ. SFA 27(2)
[Finnish Game Fish. Res. Inst., Fish. Div., P.O. Box 193, SF-00131 Helsinki 13, Finland]

82-000871 Sjöblom, V. and R. Parmanne. ABUNDANCE AND RECRUITMENT OF BALTIC HERRING AND SPRAT OFF THE COAST OF FINLAND IN 1956-68 AND 1975-80 ACCORDING TO EXPLORATORY FISHING WITH A PELAGIC TRAWL. *Int. Counc. Explor. Sea.* C.M. 1981/J:25. 15p. 1981. In English with French summ. SFA 27(2)
[Finnish Game Fish. Res. Inst., Fish. Div., P.O. Box 193, SF-00131 Helsinki 13, Finland]

82-000872 Solomon, G.; K. Matsushita; M. Shimizu and Y. Nose. THE FLUCTUATION AND DISTRIBUTION OF THE POPULATION DENSITY AND FISH MOVEMENT OF ROSE BITTERLING IN SHIN TONE RIVER. *Bull. Jpn. Soc. Sci. Fish.* 48(1):1-9. Jan. 1982. SFA 27(2)
[Dep. Fish., Fac. Agric., Univ. Tokyo, Bunkyo, Tokyo 113, Japan]

82-000873 Suuronen, P. FLUCTUATIONS OF COD OFF THE FINNISH COAST IN 1976-80 ON THE BASIS OF THE BY-CATCH OF COD IN HERRING TRAWLS. *Int. Counc. Explor. Sea* C.M. 1981/J:26. 6p. 1981. In English with French summ. SFA 27(2)
[Finnish Game Fish. Res. Inst., Fish Div., P.O. Box 193, SF-00131 Helsinki 13, Finland]

82-000874 Waters, T. F. ANNUAL PRODUCTION BY A STREAM BROOK CHARR POPULATION AND BY ITS PRINCIAL INVERTEBRATE FOOD. *Environ. Biol. Fishes* 7(2):165-170. 15 Mar. 1982. SFA 27(2)
[Dep. Entomol. Fish Wildl., Univ. Minn., St. Paul 55108] Annual production by the brook charr (*Salvelinus fontinalis*) population in Valley Creek, Minnesota, over the five-year period 1968-1972, was closely correlated to production by its main invertebrate food, *Gammarus pseudolimnaeus*, which had been reduced by siltation. Annual production was 163-191 kg ha^{-1} (wet weight) in 1968-1969, respectively, and then dropped to a minimum of 79 kg ha^{-1} in 1971, the year most seriously affected by decreased invertebrate production and siltation; year-class strength, standing stock, and total year-class (cohort production followed approximately the same pattern. Total year-class production was highest for the 1968-1969 year classes at 211-178 kg ha^{-1}, respectively, and lowest for the 1971 year class 76kg ha^{-1}. Annual P/B ratios ranged from 1.0 to 1.9; cohort P/B ratios, for the 1968-1972 year classes, ranged from 5.6 to 7.2.

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC.

82-000875 Brawn, V. M. BEHAVIOR OF ATLANTIC SALMON (*SALMO SALAR*) DURING SUSPENDED MIGRATION IN AN ESTUARY, SHEET HARBOUR, NOVA SCOTIA, OBSERVED VISUALLY AND BY ULTRASONIC TRACKING. *Can. J. Fish. Aquatic Sci.* 39(2):248-256. Feb. 1982. In English with French summ. SFA 27(2)
[c/o Dr. V.M. Srivastava, 349 Waverley Rd., Dartmouth, NS B2X 2E5, Canada]

82-000876 Carlisle, T. R. THE EVOLUTION OF PARENTAL CARE PATTERNS: A SYNTHESIS AND A STUDY OF THE BREEDING ECOLOGY OF A CICHLID FISH, *AEQUIDENS COERULEOPUNCTATUS*. *Ph.D. dissertation, Univ. Calif. (Santa Barbara)* 207p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(9):3557. Mar. 1982. SFA 27(2)

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

82-000877 Gale, W. F. and G. L. Buynak. FECUNDITY AND SPAWNING FREQUENCY OF THE FATHEAD MINNOW--A FRACTIONAL SPAWNER. *Trans. Am. Fish. Soc.* 111(1):35-40. Jan. 1982. SFA 27(2)
[Ichthyological Assoc., Inc., R.D. 1, Berwick, PA 18603]

82-000878 Garrett, G. P. VARIATION IN REPRODUCTIVE STRATEGY IN THE PECOS PUPFISH, *CYPRINODON PECOSENSIS. Ph.D. dissertation, Univ. Tex.* 209p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(7):2734. Jan. 1982. SFA 27(2)
The reproductive strategies of three populations of *Cyprinodon pecosensis* were assessed and compared. Two of the populations occurred on the Bitter Lake Wildlife Refuge, New Mexico in extremely different environments. These were studied in situ from 1977 to 1979 and experimentally in 1979 and 1980. The third population came from Salt Creek, a tributary of the Pecos River, in Texas and was used primarily for experimental populations. All three populations were found to differ greatly in their reproductive strategies. One of the populations from the Bitter Lake Refuge was located in a small, environmentally stable sinkhole. The population was relatively dense and competition was assumed to be high. The other population occurred in a large artificial impoundment that experienced extreme changes in water level. This population was also subject to predation by piscivorous fishes and waterfowl. In contrasting these two populations, members of the sinkhole poplation were found to mature at a larger size and live longer. Females of this population had smaller ovaries, produced fewer, larger eggs and were heavier bodied. Over the three year study period these parameters varied within each population, but, the differences were not as great as the interpopulational difference. Experimental manipulations showed all three populations possessed equivalent abilities for variation of every parameter except egg size. Egg size was also varied but each population appeared to have different upper and lower limits.

82-000879 Honda, H. ON THE FEMALE SEX PHEROMONES AND COURTSHIP BEHAVIOUR IN THE BITTERLINGS *RHODEUS OCELLATUS OCELLATUS* AND *ACHEILOGNATHUS LANCEOLATUS. Bull. Jpn. Soc. Sci. Fish.* 48(1):43-45. Jan. 1982. SFA 27(2)
[Bio-Environ. Lab., Cent. Res. Inst. Elec. Power Ind., Abiko, Chiba 270-11, Japan]

82-000880 Honda, H. ON THE FEMALE SEX PHEROMONES AND COURTSHIP BEHAVIOUR IN THE SALMONIDS, *ONCORHYNCHUS MASOU* AND *O. RHODURUS. Bull. Jpn. Soc. Sci. Fish.* 48(1):47-49. Jan. 1982. SFA 27(2)
[Bio-Environ. Lab., Cent. Res. Inst. Elec. Power Ind., Obiko, Chiba 270-11, Japan]

82-000881 Hourston, A. S.; H. Rosenthal and H. von Westernhagen. CONDITION AT HATCHING OF PACIFIC HERRING LARVAE FROM NATURAL AND ARTIFICIAL SPAWN OF DIFFERENT INTENSITIES ON A VARIETY OF SUBSTRATES. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1045. v + 25p. Dec. 1981. In English with French and German summ. SFA 27(2)
[Dep. Fish Oceans, Resour. Serv. Br., Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada] Herring eggs spawned naturally and artificially (from large and small fish) in 53 combinations of 14 different substrates at 5 different intensities were incubated in the laboratory at 8±1°C and 25±1°/oo salinity. Hatching occurred mainly 16-19 days after fertilization, producing larvae 7.6 to 9.1 mm in length with a dry weight of between .118 and .169 mg, a yolk volume of .267-.075 mm^3 and a condition factor of .337 to .195. Incubation period decreased as spawning intensity increased and tended to peak over a shorter period for the later hatches (lighter spawn). Average length at hatching increased with the duration of the incubation period,

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82-000881 CONTINUED dropping off temperarily immediately after the peak of hatching, then rising again before showing a second drop towards the end of the hatching period. Average weight, yolk volume and condition factor all showed trends opposite to those for average length. Data for hatchings from natural spawn showed greater variability than did data for artificial spawn but there were no apparent differences in the hatch from artificial spawn of large and small fish. The hatch from different substrates showed some differences in incubation period and related factors but this may have mainly reflected differences in spawn intensity between substrates.

82-000882 Kepner, W. G. REPRODUCTIVE BIOLOGY OF LONGFIN DACE (*AGOSIA CHRYSOGASTER*) IN A SONORAN DESERT STREAM, ARIZONA. *M.S. thesis, Ariz. State Univ.* 78p. May 1982. SFA 27(2)

The longfin dace, *Agosia chrysogaster* Girard, is the most abundant native minnow of low elevation (< 1,500 m) streams in Arizona, parts of southwestern New Mexico, and northern Mexico. Reproductive life history of longfin dace was examined over a 12-month period (1977-78) in Aravaipa Creek, Graham and Pinal counties, Arizona. Adult males and females are sexually dimorphic, clearly distinguishable by differences in size of fins. Gravid females and tuberculate males persisted throughout the year and spawned in shallow saucer-shaped depressions in sand-bottomed backwaters and runs. Although individual spawning activity was asynchronous, populations reached peak spawning conditon at least twice within the year. Peak reproductive activity was during increased discharge in spring and late summer. Fecundity was primarily a function of size. Ovary weight was highly correlated with fecundity and was the most reliable indicator of total mature ova produced.

82-000883 Kodric-Brown, A. EFFECT OF POPULATION DENSITY ON THE BREEDING SYSTEM OF *CYPRINODON PECOSENSIS*. *Proc. Desert Fishes Counc.* 12:94-95. 1980(1981). In English and Spanish. Abstract only. SFA 27(2)

[Univ. Ariz., Tucson]

82-000884 Leslie, A. J., Jr.; J. M. Van Dyke; L. E. Nall and W. W. Miley II. CURRENT VELOCITY FOR TRANSPORT OF GRASS CARP EGGS. *Trans. Am. Fish. Soc.* 111(1):99-101. Jan. 1982. SFA 27(2)

[Fla. Dep. Nat. Resour., 3900 Commonwealth Blvd., Tallahassee 32303]

82-000885 Merrick, J. R. and H. S. Midgley. SPAWNING BEHAVIOUR OF THE FRESHWATER CATFISH *TANDANUS TANDANUS* (PLOTOSIDAE). *Aust. J. Mar. Freshwater Res.* 32(6):1003-1006. 1981. SFA 27(2)

[Sch. Biol. Sci., Macquarie Univ., North Ryde, N.S.W. 2113, Australia]

82-000886 Mitchell, D. F. EFFECTS OF WATER LEVEL FLUCTUATION ON REPRODUCTION OF LARGEMOUTH BASS, *MICROPTERUS SALMOIDES*, AT MILLERTON LAKE, CALIFORNIA, IN 1973. *Calif. Fish Game* 68(2):68-77. Apr. 1982. SFA 27(2)

[Calif. Dep. Fish Game, 1234 E. Shaw Ave., Fresno 93710] Water level fluctuation was evaluated as a limiting factor to largemouth bass, *Micropterus salmoides*, nesting success at Millerton Lake, Madera and Fresno counties. Spawning behavior, nesting success, and associated physical parameters were examined during reservoir drawdown and refilling in 1973. Reproduction was adversely impacted by rising water levels, through temperature reduction, and by lowering water levels, through nest destruction. Successful nesting was observed only during periods of water stability in March and June. Where springtime water level manipulation is an essential part of reservoir operation, staged drawdowns are recommended to minimize impact on largemouth bass nesting. Methods for determining criteria for reservoir operation are described.

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

82-000887 Moodie, G. E. E. and M. Power. THE REPRODUCTIVE BIOLOGY OF AN ARMOURED CATFISH, *LORICARIA URACANTHA*, FROM CENTRAL AMERICA. *Environ. Biol. Fishes* 7(2):143-148. 15 Mar. 1982. SFA 27(2)
[Dep. Biol., Univ. Winnipeg, Winnipeg, MB R3B 2E9, Canada] The reproductive biology of one of the poorly known armoured catfishes, *Loricaria uracantha*, was studied in Panama. Natural nesting sites consisted of cavities in pieces of wood, open at both ends and positioned above the stream bottom, but artificial cavities of PVC pipe were readily used. Males possess bony bristles on the head and pectoral fins which contact the female prior to oviposition. Males spawned with up to five females in short succession and remained with the eggs until hatching. Following hatching many initiated another spawning cycle. One male was reproductively active for 73 days during which it completed five distinct reproductive cycles. Spawning extended throughout the year.

82-000888 Scott, D. B. C. THE REPRODUCTIVE BIOLOGY OF *OSTEOGLOSSUM BICIRRHOSUM* VANDELLI (OSTEICHTHYES, OSTEOGLOSSIDAE) IN AMAZONAS. *Natl. Geogr. Soc. Res. Rep.* 13:221-230. 1981. SFA 27(2)
[Univ. St. Andrews, Fife, Scotland]

82-000889 Sutterlin, A. M.; R. L. Saunders; E. B. Henderson and P. R. Harmon. THE HOMING OF ATLANTIC SALMON (*SALAR SALAR*) TO A MARINE SITE. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1058. iii + 6p. Jan. 1982. In English with French summ. SFA 27(2)
[Biol. Stn., St. Andrews, NB E0G 2X0, Canada] Atlantic salmon (*Salmo salar*) smolts reared in a distant hatchery and released at a marine site 12 km from their parent stream returned to the marine site after having spent from 13-25 mo at sea. A group of smolts chemically imprinted in salt water with morpholine and retained 2-3 wk while being fed a high fat, high protein diet, had the highest return rate. It is suggested that salmon smolts can be imprinted in the marine environment to natural and/or synthetic cues, but data are insufficient to separate effects due to imprinting, nutrition, smolt size, and delayed release on ocean survival and homing. Returning salmon remained within 2 km of the release site for a period of 2 mo until many of of them were captured. Returning grilse had ceased feeding by August 1 and were periodically captured near the release site throughout the summer and fall, during which time a progressive decrease in weight (0.26%/day), condition factor and flesh palatability occurred.

82-000890 Tribble, G. W. SOCIAL ORGANIZATION, PATTERNS OF SEXUALITY, AND BEHAVIOR OF THE WRASSE *CORIS DORSOMACULATA* AT MIYAKE-JIMA, JAPAN. *Environ. Biol. Fishes* 7(1):29-38. 15 Jan. 1982. SFA 27(2)
[4074 Puu Eleele Pl, Honolulu, HI 96816]

MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC.

82-000891 Buck, R. J. G. and A. F. Youngson. THE DOWNSTREAM MIGRATION OF PRECOCIOUSLY MATURE ATLANTIC SALMON, *SALMO SALAR* L, PARR IN AUTUMN; ITS RELATION TO THE SPAWNING MIGRATION OF MATURE ADULT FISH. *J. Fish Biol.* 20(3):279-288. Mar. 1982. SFA 27(2)
[D.A.F.S., Freshwater Fish. Lab., Pitlochry, Scotland] The autumn emigration of juvenile Atlantic salmon, *Salmo salar* L. from the Girnock Burn, Aberdeenshire, is shown to be comprised of two components. Precociously mature males and sexually immature fish differ in their dependence on seasonal and biological cues for the release of migratory behaviour. The emigration of ripe mature male parr is shown to follow the entry of mature adult salmon to the stream; when adult fish are prevented from entering the stream, the emigration is induced by seasonal factors. Spent male parr tend

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82-000891 CONTINUED not to participate in the autumn emigration. The emigration is considered to be principally an appetitive phenomenon which maximized the number of precociously mature males attaining sexual contact with adults.

82-000892 Gilmore, R. G. and C. J. Donohoe. DIEL VARIATION IN SEAGRASS BED FISH POPULATIONS. *Fla. Sci.* 45(suppl. 1):27. 1982. Abstract only. SFA 27(2)
[Harbor Branch Found., Rt. 1, Box 196, Ft. Pierce, FL 33450]

82-000893 Henley, D. T. and R. L. Applegate. SEASONAL DISTRIBUTION OF ESOCIDS IN A POWER PLANT COOLING RESERVOIR. *Prog. Fish-Cult.* 44(1):40-41. Jan. 1982. SFA 27(2)
[Ohio Dep. Nat. Resour., Akron 44314]

82-000894 Kendall, A. W., Jr. and N. A. Naplin. DIEL-DEPTH DISTRIBUTION OF SUMMER ICHTHYOPLANKTON IN THE MIDDLE ATLANTIC BIGHT. *NOAA Fish. Bull.* 79(4):705-726. Oct. 1981. SFA 27(2)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

82-000895 Kulka, D. W. and W. T. Stobo. WINTER DISTRIBUTION AND FEEDING OF MACKEREL ON THE SCOTIAN SHELF AND OUTER GEORGES BANK WITH REFERENCE TO THE WINTER DISTRIBUTION OF OTHER FINFISH SPECIES. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1038. iv + 38p. Aug. 1981. In English with French summ. SFA 27(2)
[Bedford Inst. Oceanogr., Dartmouth, NS B2Y 4A2, Canada]

82-000896 Lux, F. E. and F. E. Nichy. MOVEMENTS OF TAGGED SUMMER FLOUNDER, *PARALICHTHYS DENTATUS*, OFF SOUTHERN NEW ENGLAND. *NOAA Tech. Rep. NMFS SSRF* 752. iii + 16p. Dec. 1981. SFA 27(2)
[Northeast Fish. Cent. Woods Hole Lab., NMFS, Woods Hole, MA 02543] A total of 2,839 summer flounder were tagged on outer continental shelf and coastal grounds off southern New England in 1961-62. Tag recaptures showed the migration to offshore grounds in fall and winter and to inshore areas in spring and summer. Recaptures from coastal grounds were recorded from northern New Jersey to south of Cape Cod; those from outer shelf grounds were from Baltimore Canyon on the southwest to Veatch Canyon on the northeast. The overall tag return rate was 21.2%; however, the returns from inshore tagging (44.5%) were much higher than those from offshore releases (8.4%), suggesting that tagging mortality was higher offshore.

82-000897 Nieman, D. A. and M. D. Clady. WINTER MOVEMENT OF FLORIDA AND NORTHERN LARGEMOUTH BASS NEAR A HEATED EFFLUENT. *Proc. Annu. Conf. Southeast. Assoc. Fish. Wildl. Agencies* 34:11-18. 1980[1981]. SFA 27(2)
[RMC-Ecol. Div., R.D. 1, Pottstown, PA 19464] Winter home ranges and movements of northern and Florida largemouth bass (*Micropterus salmoides salmoides* and *M. s. floridanus*) in a heated cove of Boomer Lake, Oklahoma, were estimated by using ultrasonic telemetry. Within the heated cove, individuals of both subspecies (3 northern, 2 Florida) occupied home ranges that appeared to be related to the distribution of heated water, cover, current, depth, and food. Other fish of both subspecies left the heated cove and did not return. No periodic migrations into or out of the heated cove were observed, although tagged bass frequently moved among several limited areas of cover within the cove. No clear behavioral differences between subspecies were found that might explain the lower over-winter survival of Florida largemouth bass in Boomer Lake, but it appeared that mortality was not due solely to low temperature.

MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC. (CONTINUED)

82-000898 Pollock, B. R. MOVEMENTS AND MIGRATIONS OF YELLOWFIN BREAM, *ACANTHOPAGRUS AUSTRALIS* (GÜNTHER), IN MORETON BAY, QUEENSLAND AS DETERMINED BY TAG RECOVERIES. *J. Fish Biol.* 20(3):245-252. Mar. 1982. SFA 27(2)
[Queensland Fish. Serv., Transport House, Fortitude Valley, Queensland, Australia] Yellowfin bream were tagged and released in three non-spawning areas and two spawning areas in Moreton Bay, a large estuarine system on the east coast of Australia. A total of 194 fish were recaptured. Juvenile fish made only small-scale movements (less than 6 km) from the release site. Small-scale movements were also recorded for adult fish, although large-scale movements from 10 to 90 km were also recorded. The large-scale movements appear to be associated with the migration of adult fish to or from surf bar spawning areas. Some adult fish remained in feeding areas during the spawning season (May-August). There was no indication from tag recoveries of any movements of yellowfin bream outside Moreton Bay and the results indicate that adult yellowfin bream in Moreton Bay may be regarded as a unit stock for the purpose of fisheries management.

82-000899 Rinne, J. N. and B. Wanjala. OBSERVATIONS ON MOVEMENT PATTERNS OF *TILAPIA* SPP. IN NYANZA GULF, LAKE VICTORIA, EAST AFRICA. *J. Fish Biol.* 20(3):317-322. Mar. 1982. SFA 27(2)
[U.S. For. Serv., For. Sci. Lab., Ariz. State Univ., Tempe 85287]

82-000900 Robertson, D. R. and S. A. Foster. OFF-REEF EMIGRATION OF YOUNG ADULTS OF THE LABRID FISH *EPIBULUS INSIDIATOR*. *Copeia* 1982(1):227-229. 23 Feb. 1982. SFA 27(2)
[Smithsonian Trop. Res. Inst., Box 2072, Balboa, Panama]

FOODS/FEEDING

82-000901 Ajayi, T. O. FOOD AND FEEDING HABITS OF *RAJA* SPECIES (BATOIDEI) IN CARMARTHEN BAY, BRISTOL CHANNEL. *J. Mar. Biol. Assoc. U.K.* 62(1):215-223. Feb. 1982. SFA 27(2)
[Nigerian Inst. Oceanogr. Mar. Res., Victoria Island, P.M.B. 12729, Lagos, Nigeria] The food preferences of three rays, *Raja clavata* L., *R. microocellata* Montague and *R. montagui* Fowler were studied in Carmarthen Bay, South Wales. Within each species the size groups to a large extent preyed on different items. Between species, diets of *R. clavata* and *R. montagui* were the most similar. Crustaceans, mainly shrimps and crabs, were important to all three. Fish, though also consumed by *R. clavata* and *R. montagui* were the predominant food of larger *R. microocellata*. Cannabalism occurred occasionally.

82-000902 Bagge, P. and L. Hakkari. THE FOOD AND PARASITES OF FISH IN SOME DEEP BASINS OF NORTHERN L. PÄIJÄNNE. *Hydrobiologia* 86(1-2):61-65. 16 Jan. 1982. SFA 27(2)
[Hydrobiol. Res. Cent., Univ. Jyväskylä, SF-40100 Jyväskylä 10, Finland]

82-000903 Bahuguna, S. N. and H. R. Singh. FOOD AND FEEDING HABITS OF A HILLSTREAM FISH, *GLYPTOTHORAX PECTINOPTERUM* (MC CLELLAND). *Indian J. Anim. Sci.* 51(10):964-967. 1981. SFA 27(2)
[Garhwal Univ., Sringager Garhwal, Uttar Pradesh 246 174, India] The paper presents an account of the food and feeding habits of *Glyptothorax pectinopterum* (Mc Clelland) collected from the Garhwal hillstreams. It is a

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82-000903 CONTINUED bottom feeder fish subsisting on insects and crustaceans. The feeding intensity attains two peaks in a year, the first in February-March and the second in November. The change in feeding intensity appears to be correlated with the availability of food items in nature.

82-000904 Bohnsack, J. A. CORAL REEF FISH COMMUNITIES: EFFECTS OF PREDATOR REMOVAL. *Fla. Sci.* 45(suppl. 1):27. 1982. Abstract only. SFA 27(2)

[Coop. Inst. Mar. Atmos. Sci., Univ. Miami, 4600 Rickenbacker Causeway, Miami, FL 33149] The hypothesis that piscivorous predators control coral reef fish community structure was experimentally tested in the Florida Keys. Random visual censuses were made for one year on large control and experimental reefs. The experimental reef, Looe Key Reef, has been continually exploited by heavy spearfishing pressure which is particularly effective at removing the top predators. Control reefs in the Key Largo Coral Reef Preserve have been protected from spearfishing since 1960. Data show significantly fewer piscivorous predators present on the experimental reef, although one grouper, *Epinephelus cruentatus*, normally too small to spear, appeared to show some density compensation. Several non-piscivorous predator species showed significant abundance differences between experimental and control reefs. More rigorous testing of the hypothesis is currently underway.

82-000905 Coates, L. J.; J. C. Roff and D. F. Markle. FRESHWATER COMPONENTS IN THE DIET OF THE MARINE NEUSTONIC FISH, *UROPHYCIS TENUIS* (MITCHILL). *Environ. Biol. Fishes* 7(1):69-72. 15 Jan. 1982. SFA 27(2)

[Dep. Zool., Coll. Biol. Sci., Univ. Guelph, Guelph, ON N1G 2W1, Canada] Stomach content analysis of a neustonic marine juvenile white hake (*Urophycis tenius* (Mitchill)), revealed the presence of a unusual 0.70mm bolus, consisting of a freshwater rotifer, *Keratella cochlearis*, and several species of freshwater phytoplankton; *Asterionella formosa*, *Melosira granulata*, *Dinobryon bavaricum* and *Dinobryon cylindricum*. Other gut items were typical for the predator during the August period, consisting of various stages of marine calanoid copepods and cladocerans; average prey length was 0.74mm. The possibility of bolus introduction as a secondary diet component was eliminated; evidence indicated that the particle was ingested in toto. Consideration of a number of alternative mechanisms for bolus acquisition led to the conclusion that the bolus was disseminated via the ballast tank or contaminated freshwater holding tank of a ship. *Urophycis tenuis* appears to feed selectively on the basis of particle size. Consequently, this type of neustonic predator may be particularly vulnerable to man-made pollution and oil spills.

82-000906 Crist, L. DISTRIBUTION AND FOOD HABITS OF LEAST CHUB (*IOTICHTHYS PHLEGETHONTIS*) IN A SPRING-MARSH COMPLEX IN WESTERN UTAH. *Proc. Desert Fishes Counc.* 12:77-78. 1980(1981). In English and Spanish. Abstract only. SFA 27(2)

[Bio/West, Inc., Logan, UT 84321]

82-000907 Drenner, R. W.; W. J. O'Brien and J. R. Mummert. FILTER-FEEDING RATES OF GIZZARD SHAD. *Trans. Am. Fish. Soc.* 111(2):210-215. Mar. 1982. SFA 27(2)

[Dep. Biol., Tex. Christian Univ., Fort Worth, TX 76129]

82-000908 Drenner, R. W.; G. L. Vinyard; M. Gophen and S. R. McComas. FEEDING BEHAVIOR OF THE CICHLID, *SAROTHERODON GALILAEUM*: SELECTIVE PREDATION ON LAKE KINNERET ZOOPLANKTON. *Hydrobiologia* 87(1):17-20. 12 Feb. 1982. SFA 27(2)

[Dep. Biol., Tex. Christian Univ., Ft. Worth 76129] In laboratory feeding trials, we analyzed the feeding behavior and selectivity of the cichlid,

FOODS/FEEDING (CONTINUED)

82-000908 CONTINUED *Sarotherodon galilaeum*, for zooplankton prey from Lake Kinneret, Israel. The feeding behavior was dependent on fish size. Fish less than 20mm SL fed on zooplankton as obligate particulate feeders. Fish from 20 to 42mm SL fed either as particulate feeders or as filter feeders. Fish larger than 62mm SL fed as obligate filter feeders. Particulate-feeding fish were size selective and had highest feeding electivities for large-size zooplankton species. Filter-feeding fish had highest feeding electivities for zooplankton species with poor escape ability. In general, *S. galilaeum* predation pressure would be greatest on *Ceriodaphnia reticulata*, a large-bodied and easily captured species which is selected by both particulate-feeding and filter-feeding fish.

82-000909 Ellertsen, B.; H. Loeng; F. Rey and S. Tjelmeland. "LODDA PÅ SOMMERBEITE". FELTOBSERVASJONER I 1979 OG 1980. [THE FEEDING CONDITIONS OF CAPELIN DURING SUMMER. FIELD OBSERVATIONS IN 1979 AND 1980.] *Fisken Havet* 1981(3):1-68. 1981. In Norwegian with English summ. SFA 27(2)
[Havforskningsinst., Bergen, Norway]

82-000910 Fagade, S. O. THE FOOD AND FEEDING HABITS OF *SAROTHERODON GALILAEUS* FROM A SMALL LAKE. *Arch. Hydrobiol.* 93(2):256-263. 1982. In English with German summ. SFA 27(2)
[Dep. Zool., Univ. Ibadan, Ibadan, Nigeria] The results of detailed qualitative and quantitative analyses of food found in the gut of *Sarotherodon galilaeus* are provided. It is shown that averagely the food in the full stomachs constitute 0.55% of the body weight while food in the intestine consititute 1.65% of the body weight. Information on the dry weight of food in relation to body weight is also provided. The food items encountered in the gut covers a wide spectrum. The species is shown to feed on a wider variety of plant materials than animals. The dominant plants include pennate and centric diatoms and an assortment of unicellular, colonial and filamentous algae. In addition the species also feed on a wide range of animals. These include protozoans, bryozoan colony, rotifers, copepods, ostracods, cladocerans, insect larvae and pupae, arthropod appendages and gastropods. The food items found in the stomachs and intestines are shown to have slight differences. The labile food habits is discussed in relation to the success of the species in the small lake at the International Institute of Tropical Agriculture (IITA).

82-000911 Gabriel, W. L. and W. G. Pearcy. FEEDING SELECTIVITY OF DOVER SOLE, *MICROSTOMUS PACIFICUS*, OFF OREGON. *NOAA Fish. Bull.* 79(4):749-763. Oct. 1981. SFA 27(2)
[Fish. Prog., Dep. For. Wildl. Manage., Univ. Mass., Amherst 01003]

82-000912 Ghion, F. VERIFICA SPERIMENTALE DELLA SELEZIONE DIMENSIONALE OPERATA DAI CEFALI SULLA BASE ALIMENTARE. [EXPERIMENTAL CONTROL OF FOOD SIZE SELECTION IN MULLETS.] *Riv. It. Piscic. Ittiop.* 16(4):122-125. Oct.-Nov.-Dec. 1981. In Italian with English summ. SFA 27(2)
[Cent. Ittiol. Valli Venete Cà Pisani-Cà Venice (RO), Italy]

82-000913 Hacunda, J. S. TROPHIC RELATIONSHIPS AMONG DEMERSAL FISHES IN A COASTAL AREA OF THE GULF OF MAINE. *NOAA Fish. Bull.* 79(4):775-788. Oct. 1981. SFA 27(2)
[Grad. Sch. Oceanogr., Univ. R.I., Kingston 02881]

FOODS/FEEDING (CONTINUED)

82-000914 Harada, K.; H. Maéda and K. Kobayashi. [APPLICATION OF LOGISTIC CURVE AS AN INDEX OF THE ATTRACTIVE EFFECT OF FOOD FOR ORIENTAL WEATHERFISH.] *Bull. Jpn. Soc. Sci. Fish.* 48(1):21-29. Jan. 1982. In Japanese with English summ. SFA 27(2)
[Shimonoseki Univ. Fish., Yoshimi, Shimonoseki 759-65, Japan]

82-000915 Hourston, A. S.; H. Rosenthal and S. Kerr. CAPACITY OF JUVENILE PACIFIC HERRING (*CLUPEA HARENGUS PALLASI*) TO FEED ON LARVAE OF THEIR OWN SPECIES. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1044. v + 9p. Dec. 1981. In English with French and German summ. SFA 27(2)
[Dep. Fish. Oceans, Resour. Serv. Br., Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada] Juvenile Pacific herring in the juvenile stage were observed to feed on newly hatched larvae of their own species when the two occur concomitantly. In order to assess the capacity of juvenile herring to consume herring larvae, ten juveniles were fed to satiation in laboratory tanks for 2-6h during each of 3 consecutive days. Individual fish were observed for a period of 1 min and the number of larvae consumed was counted. During the first feeding experiment, individual juveniles consumed an average of 17 larvae per min during the first 20 min: consumption dropped to 8 per min during the next 20 min, after which the satiated juveniles consumed an average of only 1.6 larvae per min. Two subsequent experiments produced similar results, except that the first 20 min stage was bypassed (presumably the juveniles were less hungry) and the pre-satiation feeding rate was only 4 larvae per min. Following a longer period without feeding, a fourth experiment was conducted in which the initial 10 min feeding stage was compared to that observed in the first experiment. Separate observations during the third experiment on 6 larger fish showed that they consumed two-thirds more larvae than did 4 smaller fish. The implications of such cannibalism on natural stocks of larval herring are discussed.

82-000916 Howick, G. L. THE TACTICAL FEEDING ECOLOGY OF LARGEMOUTH BASS (*MICROPTERUS SALMOIDES*). *Ph.D. dissertation, Univ. Kans.* 70p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(8):3102. Feb. 1982. SFA 27(2)
The predation cycle was used as a conceptual framework to design laboratory experiments to analyze pescivory by largemouth bass. The probability of prey location under various conditions was examined by measuring reaction distance (RD). Reaction distance was always found to be linearly related to prey length, however the exact relationship was dependent on prey species, movement of prey and light intensity. Small minnows and bluegills elicited similar RD's but large minnows elicited greater RD's than the same sized bluegills. Simulated swimming of prey increased RD only to the smaller prey sizes. This is explained by the shorter RD of the smaller prey which gives them a greater angular velocity at the point of reaction. Decreasing light intensity did not effect RD until it dropped below 5 lux. Probability of pursuit was analyzed with binary choice experiments. When offered a choice of two stationary prey, bass usually selected the closer prey unless the farther prey appeared larger by 0.5 degrees of visual angle. If the prey choice was between a stationary and a moving prey, the moving prey had an increased probability of being pursued. Handling time was exponentially related to prey length. Attack success appeared to be exponentially related to prey length, however there was considerable variation within prey size classes. The distance at which bluegill sunfish reacted to an oncoming bass (startle distance) was measured. Bluegill length did not affect startle distance (SD). However, it appeared that SD was linearly related to bass length. There was a corresponding decrease in SD with decreasing light intensity. As a result, bluegill SD was greater than bass RD for most sizes of bluegills at high light intensity. This situation was reversed at low light intensities. This suggests that bass have a tactical advantage at low light intensities. This may be the selective advantage for the evolution of crepuscular feeding by bass.

FOODS/FEEDING (CONTINUED)

82-000917 Hyatt, K. D. MECHANISMS OF FOOD RESOURCE PARTITIONING AND THE FORAGING STRATEGIES OF RAINBOW TROUT (*SALMO GAIRDNERI*) AND KOKANEE (*ONCORHYNCHUS NERKA*) IN MARION LAKE, BRITISH COLUMBIA. *Ph.D. dissertation, Univ. British Columbia* 1980. From Diss. Abstr. Int. B Sci. Eng. 42(7):2678. Jan. 1982. SFA 27(2)

The acquisition of relatively large, rare prey by trout is promoted by: a tendency to occupy littoral and benthic habitats, procedures for area-extensive search; a predisposition to attach large, armoured prey; large mouth size; persistent responses to opportunities to attack large prey; an inability to maintain high attack rates on small prey at high densities and a tendency to ignore or reject such prey. The acquisition of relatively small but abundant prey by kokanee is promoted by: a tendency to occupy limnetic and water-column habitats; a predisposition to attack relatively small, morphologically uniform prey; small mouth size; well developed gill-rakers; an ability to sustain high attack rates on small planktonic prey; low ingestion success with various large, benthic prey and a tendency to ignore or reject such prey. I conclude that the intimately related sets of traits that control food-resource partitioning by trout and kokanee represent mutually exclusive foraging strategies that have been shaped as evolutionary responses to specific features of a given habitat-prey complex.--From abstr.

82-000918 Jacob, S. S. and N. B. Nair. FOOD AND FEEDING HABITS OF THE LARVIVOROUS FISH *APLOCHEILUS LINEATUS* (CUV. & VAL.) IN ITS NATURAL HABITAT. *J. Fish Biol.* 20(3):329-339. Mar. 1982. SFA 27(2)

[Dep. Aquatic Biol. Fish., Univ. Kerala, Trivandrum 695007, India] Results are presented of a study of the food and feeding habits of *Aplocheilus lineatus* under natural conditions and the manner in which dietary preferences are influenced by the habitat/environment, seasons and stage of maturity of the fish is explained, based on data from monthly random samples collected for a year. A qualitative assessment of the diet reveals that it is not confined to a varied range of aquatic fauna, but also encompases allochthonous fauna. Quantitative and qualitative analyses of the diet indicate its feeding habit which does not alter with size or seasonal changes. The range of prey consumed does not differ radically, qualitatively, as a function of size, but quantitatively exhibits five levels of discrimination and differential exploitation related mainly to prey size. Seasonal fluctuations in feeding are more qualitative than quantitative and seem dependent on the occurrence of food organisms. The lack of correlation between breeding and feeding is linked to extent of the development of the gonad in the body cavity. In conclusion, the potential of the fish as an effective biological control agent of mosquito larvae is indicated by the fact that dipteran larvae are a preferred item of its diet in all size groups.

82-000919 Jacob, S. S.; N. B. Nair and N. K. Balasubramanian. INFLUENCE OF CERTAIN ENVIRONMENTAL FACTORS ON THE PREDATORY EFFICIENCY OF THE LARVICIDAL FISH, *APLOCHEILUS LINEATUS* (CUV. & VAL.). *Arch. Hydrobiol.* 93(3):341-351. 1982. In English with German summ. SFA 27(2)

[Dep. Aquatic Biol. Fish., Univ. Kerala, Trivandrum 695007, India] The assessment of the degree to which environmental factors affect predatory efficiency of the larvicidal fish *Aplocheilus lineatus* reveals that predation is dependent in a quantifiable way on the variables of the environmental complex surrounding the prey-predator system. Predation rate is minimal at low temperatures and increases at a statistically significant rate with rise in temperature. Feeding under conditions of light is significantly higher than in darkness. Salinities of up to 21.83^{o}/oo do not affect predatory efficiency; at this level however, stress conditions lead to a slackening in food intake. Fish size, investigated to aid extrapolation of data, influences predation in that it increases at a statistically significant rate with increase in size of the individual. In terms of unit body weight, predatory efficiency declines as size increases. The time course of predation is not altered regularly or significantly by environmental

FOODS/FEEDING (CONTINUED)

82-000919 CONTINUED factors; haphazard intake subsequent to satiation and/or a "learning" factor may be responsible for this. The potenetial of the fish as a biocontrol agent of mosquito larvae is indicated by the fact that its predatory efficiency is higher than that of the conventional larvivore, *Gambusia affinis*.

82-000920 Keen, W. H. BEHAVIORAL INTERACTIONS AND BODY SIZE DIFFERENCES IN COMPETITION FOR FOOD AMONG JUVENILE BROWN BULLHEAD (*ICTALURUS NEBULOSUS*). *Can. J. Fish. Aquatic Sci.* 39(2):316-320. Feb. 1982. In English with French summ. SFA 27(2)
[Dep. Biol. Sci., State Univ. N.Y., Cortland 13045]

82-000921 Kimura, S. [FEEDING HABIT OF *PARAPRISTIPOMA TRILINEATUM* IN KUMANO-NADA, CENTRAL JAPAN.] *Bull. Jpn. Soc. Sci. Fish.* 47(2):1551-1558. In Japanese with English summ. SFA 27(2)
[Fish. Res. Lab., Mie Univ., Wagu, Shima, Mie 517-07, Japan] The present report deals with the feeding habit of *Parapristipoma trilineatum*, Pomadasyidae, based on 1208 individuals taken from coastal areas of Kumano-nada (Kii Peninsula, central Japan) from March 1978 to September 1980. Empty stomachs occurred more frequently in the samples collected by hook and line than in the samples collected by set net. Feeding activity was intense during the period from May to September, and declined after October. The main food of the immatures and adults, larger than 100 mm in fork length, was clupeoid fishes, but crustaceans were fed on abundantly in March, June, November and December. Clupeoid fishes appeared as prey animal in almost all seasons. Copepods chiefly appeared in spring and autumn, while amphipods in summer. The main food of juveniles, smaller than 50 mm, were copepodid larvae and bivalue larvae. Those of young, 50-100 mm, were *Eucalanus* spp., copepodid larvae, mysis larvae, zoea larvae and clupeoid larvae. Maximum value of αmax (=PLmax/L;l, length of predator; PLmax, maximum size of prey) was 58% in the fish 50-100 mm in fork length. The value of αmax declined with groth for the fish larger than 100 mm.

82-000922 Knight, R. L.; F. J. Margraf and R. F. Carline. PREDATION BY WALLEYE (*STIZOSTEDION VITREUM*) AND YELLOW PERCH (*PERCA FLAVESCENS*) ON FORAGE FISHES IN WESTERN LAKE ERIE. *Ohio J. Sci.* 82(2):98. 1982. Abstract only. SFA 27(2)
[Ohio Coop. Fish. Res. Unit, Ohio State Univ., Columbus 43210] In this study, we documented the food habits of adult walleye (*Stizostedion vitreum*) and yellow perch (*Perca flavescens*) and related diet selection to forage fish availability. Two offshore stations in the Western Basin of Lake Erie were sampled over a 3-year period with bottom trawls and gillnets. We removed stomachs from about 500 walleyes and 1,200 yellow perch, analyzed their contents, and compared these data to the size distribution and relative abundance of their primary prey. Walleye were more piscivorous than yellow perch and did not switch to invertebrates when forage fish abundances were low. Yellow perch were omnivorous and readily converted to an invertebrate diet when forage fishes were less available. Walleye ate yearling shiners (*Notropis* spp.) in spring and early summer, then shifted to gizzard shad (*Dorosoma cepedianum*), alewife (*Alosa pseudoharengus*), and other abundant young-of-year fishes in late summer and early fall. Walleye switched back to shiners in late fall because other fishes were too large. Picivorous yellow perch preferred similar food to walleye but were cannibalistic in some instances. Walleye seldom selected prey greater than 40% of their total length whereas yellow perch occasionally ingested prey more than 50% of their length. Walleye and yellow perch were opportunistic feeders with relative abundance of prey largely determining diet selection. In western Lake Erie, abundance of forage fishes probably influence walleye and yellow perch growth rates.

FOODS/FEEDING (CONTINUED)

82-000923 Kratz, K. and G. L. Vinyard. MECHANISMS OF PREY SELECTIVITY IN THE PIUTE SCULPIN, *COTTUS BELDINGI*. *Cal-Neva Wildl. Trans.* p. 11-18. 1981. SFA 27(2)

[Dep. Biol., Univ. Nevada, Reno 89557] The mechanics of the predation of the sculpin, *Cottus beldingi*, was examined in artificial laboratory stream conditions using three different prey types; *Gammarus lacustris*, *Arcynopteryx californicus*, and *Ephemerella (drunella)*. It was found that encounter probability and capture success were most important in determining the observed prey selectivity. In feeding trials in which all three prey species were present selectivity was highest for *Gammarus* and lowest for *Ephemerella*. This reflects the observed differences in the activity levels of these species.

82-000924 Longval, M. J.; R. M. Warner and S. H. Gruber. CYCLICAL PATTERNS OF FOOD INTAKE IN THE LEMON SHARK *NEGAPRION BREVIROSTRIS* UNDER CONTROLLED CONDITIONS. *Fla. Sci.* 45(1):25-33. 1981. SFA 27(2)

[Rosenstiel Sch. Mar. Atmos. Sci., Univ. Miami, Div. Biol. Living Resour., 4600 Rickenbacker Causeway, Miami, FL 33149] Food intake of lemon sharks was investigated to determine whether hunger and satiation play a role in their behavior. Lemon sharks (*Negaprion brevirostris*) were placed under controlled conditions and given a single 45 min feeding trial each day for 95 da. During a trial the sharks were offered preweighed pieces of fish fillet and rate of feeding was individually monitored. A spectral analysis of the intake data revealed a tendency toward 4-day cycles in amount eaten. We suggest that the 4-day cycle reflects an internally mediated biological rhythm. Thus, appetite varies over time and satiation certainly operates in the behavior of lemon sharks.

82-000925 Malmqvist, B. and C. Brönmark. FILTER FEEDING IN LARVAL *LAMPETRA PLANERI*: EFFECTS OF SIZE, TEMPERATURE AND PARTICLE CONCENTRATION. *Oikos* 38(1):40-46. Jan. 1982. SFA 27(2)

[Dep. Anim. Ecol., Univ. Lund, Ecol. Bldg., S-223 62 Lund, Sweden] The filtration rate of differently sized larval *Lampetra planeri* (Bloch) was estimated experimentally for a set of temperatures ranging from 2.5 to 25°C, and for 9 different food particle concentrations at 15°C. The food material presented consisted of suspended yeast. The concentration was measured indirectly as turbidity. Large larvae had a higher absolute filtration rate than small ones and were less dependent on temperature. If respiration was considered, the most "economic" filtration was achieved below 10°C. This is in accordance with the low mean annual temperature of typical *Lampera planeri* streams. High ratio of filtration to respiration was seen to coincide with maximum food availability of the stream from where the larvae were collected. Low particle concentrations were compensated for by an increased filtration rate. In the interval between 30 and 100 mg dry weight of suspended yeast per litre, larvae increased their rates of filtration. The importance of *Lampetra planeri* larvae in depleting the water of particles was calculated to be minimal. Less than 1.10^{-4}% of the water passing each metre of stream length was filtered by the lampreys.

82-000926 Mann, R. H. K. THE ANNUAL FOOD CONSUMPTION AND PREY PREFERENCES OF PIKE (*ESOX LUCIUS*) IN THE RIVER FROME, DORSET. *J. Anim. Ecol.* 51(1):81-95. Feb. 1982. SFA 27(2)

[Freshwater Biol. Assoc., River Lab., East Stoke, Wareham, Dorset, England] The annual maintenance coefficient, 0.815 g $g^{-1}yr^{-1}$(95% C.L. 0.260-1.231), and the efficiency of food utilization, 2.167 (95% C.L. 1.193-3.141), were estimated from feeding experiments in flowing-water channels using four adult *Esox lucius*, size range 624-1010g. The annual food consumption of *E. lucius* in the River Frome was estimated to be 151.06kg ha^{-1} (95% C.L. 122.14-207.74). This supported an annual *E. lucius* production of 41.34kg ha^{-1} (95% C.L. 33.42-56.82). The proportion of food used for maintenance by each age-group increased from

FOODS/FEEDING (CONTINUED)

82-000926 CONTINUED 24.3% at age 1 to 77.5% at age 10 years. *Esox lucius* aged 1 year and older were predominantly piscivorous; less than 1% by weight of their prey were invertebrate animals. Variations in the composition of *E. lucius* diets resulted from changes in the relative influences of prey availability, food selection by *E. lucius*, and the seasonal abundance of prey. Young *E. lucius* ate chiefly *Leuciscus leuciscus, Gobio gobio, Phoxinus phoxinus, Neomacheilus barbatulus* and, in April, migrating *Salmo salar* smolts; larger *E. lucius* ate chiefly *L. leuciscus, Salmo trutta, Thymallus thymallus, Anguilla anguilla* and small *E. lucius*. Cannibalism on *E. lucius* aged between 6 months and 2 years accounted for most of their natural mortality. It is suggested that, in game fisheries, the removal of coarse fish and large *E. lucius* may not always result in increased numbers of salmoids.

82-000927 Matallanas, J. FEEDING HABITS OF *SCYMNORHINUS LICHA* IN CATALAN WATERS. *J. Fish Biol.* 20(2):155-163. Feb. 1982. SFA 27(2)

[Dep. Zool., Auton. Univ. Barcelona, Bellaterra, Barcelona, Spain] A study has been made of the diet of *Scymnorhinus licha* in Catalan coastal waters by means of the analysis of the stomach contents of 97 specimens caught at depths ranging from 300 to 600 metres during a 12 month survey. The annual coefficient of repletion is 80%. Bony fishes form the basic group in the diet for all seasons: they are followed by sharks, crustaceans and cephalopods, which are secondary. As the size of *S. licha* increases, there is an increase in the frequency of crustaceans and sharks in the stomach contents and a drop in the frequency of cephalopods. Bony fishes are slightly more frequent in the larger specimens. The males have a higher coefficient of repletion and a higher average of prey per stomach and show a greater preference for sharks and bony fishes.

82-000928 Morton, W. M. COMPARATIVE CATCHES AND FOOD HABITS OF DOLLY VARDEN AND ARCTIC CHARRS, *SALVELINUS MALMA* AND *S. ALPINUS*, AT KARLUK, ALASKA, IN 1939-1941. *Environ. Biol. Fishes* 7(1):7-28. 15 Jan. 1982. SFA 27(2)

[E.K. Balon: Dep. Zool., Coll. Biol. Sci., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

82-000929 Persson, L.-E. WERE MACROBENTHIC CHANGES INDUCED BY THINNING OUT OF FLATFISH STOCKS IN THE BALTIC PROPER? *Ophelia* 20(2):137-152. Dec. 1981. SFA 27(2)

[Dep. Anim. Ecol., Ecol. Bldg., S-223 62 Lund, Sweden] Possible causes of longterm increase in macrobenthic biomass in the Baltic proper are discussed. Eutrophication by means of nutrient enrichment is shown to be a process of the last three decades. It is assumed that primary production has doubled during this time. Macrobenthic data from the southern Baltic indicate highly increased biomass values above the halocline between the 1920s and 1950s. During the last three decades no biomass increase was found. Because of these facts, eutrophication is rejected as a major cause of increased macrobenthic biomass. Flatfish populations in the southern Baltic were very dense before the 1920s. This resulted in stunted growth due to strong competition for food. After heavy exploitation in the 1920s and the early 1930s, these stocks were thinned out and showed significantly higher growth rates due to the reduced competition. In the late 1930s the catches of cod increased markedly. Based on evidence from studies of predator-prey relationships it is proposed that the increased macrobenthic biomass values are due to the decreased grazing pressure following the exploitation of the flatfishes. Furthermore, it is assumed that the increase of the stock of cod in the 1930s was due to reduced food competition between young cod and flatfishs, especially the dab.

FOODS/FEEDING (CONTINUED)

82-000930 Pidgeon, R. W. J. DIET AND GROWTH OF RAINBOW TROUT *SALMO GAIRDNERI* RICHARDSON, IN TWO STREAMS ON THE NEW ENGLAND TABLELAND, NEW SOUTH WALES. *Aust. J. Mar. Freshwater Res.* 32(6):967-974. 1981. SFA 27(2)

[Dep. Zool., Univ. New England, Armidale, N.S.W. 2351, Australia] The diets and growth rates of rainbow trout in the Wollomombi and Guy Fawkes Rivers in northern New South Wales were examined. The growth rate of trout in the Wollomombi River was much higher than that of fish in the Guy Fawkes River. Spearman rank correlation coefficients indicated that stream type was more important than fish size in determining the composition of the diet of the trout. Benthic invertebrates formed the largest component of the diet in both streams: 66.0 and 63.0% of ash-free dry weight (AFDW) in the Wollomombi River and the Guy Fawkes River, respectively. Trout in the Wollomombi River consumed more nektonic prey (33.3% of AFDW) than fish in the Guy Fawkes River (3.6% of AFDW). In contrast, surface food (aquatic imagines and terrestrial insects) made up a much higher proportion of the diet of trout in the Guy Fawkes River (33.9% of AFDW) than in the Wollomombi River (0.6% of AFDW). Crayfish were a major component of the diet (in terms of AFDW) in both streams, their proportions increasing with fish size. The significance of crayfish in relation to fish growth is discussed.

82-000931 Polgar, T. T. and P. Souza. ANALYSIS OF STRIPED BASS LARVAL FEEDING HABITS IN THE POTOMAC ESTUARY: 1976-1977. *Proc. Annu. Meet. Potomac Chap. Am. Fish. Soc.* 5:115-138. 1981(1982). SFA 27(2)

[Environ. Cent. Martin Marietta Corp., 1450 South Rolling Rd., Baltimore, MD 21227] The connections between striped bass larval feeding habits and zooplankton prey composition and abundance in 1976 and 1977 were investigated using data collected by the University of Maryland. Inferences are drawn from the rsults on those aspects of feeding habits that might affect spatial-temporal larval distributions and survivals: food availability and preferences. The analyses indicate that the distributions of feeding and non-feeding larvae are spatially and temporally dependent only in the finfold stage, and that spatial and temporal interactions in feeding condition reflect the evolution of larval abundance distributions due to transport differential mortality. The feeding conditions of yolksac larvae depend on their size (larger larvae feed), and therefore, on development multivariate, non-parametric tests of stomach contents versus zooplankton density and composition). Tests on particularly important prey taxa, adjusted for environmental zooplankton abundance, indicate a few feeding preferences by various larval stages. However, it is possible that higher resulution data on larval stomach contents and zooplankton, providing greater power in statistical tests, might reveal further feeding preferences.

82-000932 Robotham, P. W. J. AN ANALYSIS OF A SPECIALIZED FEEDING MECHANISM OF THE SPINED LOACH, *COBITIS TAENIA* (L.), AND A DESCRIPTION OF THE RELATED STRUCTURES. *J. Fish Biol.* 20(2):173-181. Feb. 1982. SFA 27(2)

[Div. Biol., Derby Lonsdale Coll. High. Educ., Kedleston Rd., Berby, United Kingdom] Aquarium observations and gut analyses of the spined loach, *Cobitis taenia*, suggested that use of a technique by which small items of food could be removed from an almost constant stream of substrate, taken in through the mouth and passed out through the gills. The small amount of indigestible substrate present in the gut contents indicated a very high efficiency level for the process. Photographic investigation revealed a two phased feeding cycle based on the respiratory pumps, consisting of an induction/separation phase and an expulsion/swallowing phase. A morphological study showed large concentrations of mucus secreting goblet cells on the roof of the anterior buccopharyngeal cavity. Other morphological adaptations were noted which resulted in a narrowing of the anterior buccal cavity and a widening of the posterior part along with an increase in the distance between the gill rakers. In the light of this information a method of separation based on differential densities of particles being trapped in a constant stream of mucus is postulated.

FOODS/FEEDING (CONTINUED)

82-000933 Setzler-Hamilton, E. M.; P. W. Jones; F. D. Martin; K. Ripple; J. A. Mihursky; G. E. Drewry and M. Beaven. COMPARATIVE FEEDING HABITS OF WHITE PERCH AND STRIPED BASS LARVAE IN THE POTOMAC ESTUARY. *Proc. Annu. Meet. Potomac Chap. Am. Fish. Soc.* 5:139-157. 1981(1982). SFA 27(2)

[Univ. Md. Cent. Environ. Estuarine Stud., Chesapeake Biol. Lab., Solomons] Gut contents of 2,578 larval white perch, *Morone americana*, and 1,418 larval striped bass, *M. saxatilis*, were analyzed from samples collected in the Potomac River Estuary during 1976 and 1977. Larval white perch began feeding at 3mm TL and striped bass at 5mm TL. At any given size both species consumed the same prey species though proportions varied. Small white perch and striped bass consumed large proportions of rotifers, especially in 1976. Larger sizes ate few or none and primarily fed on copepods and cladocerans. Gut content biomass of both species, however, consisted primarily of copepods, with adult copepods being the dominant constituent after the larvae reach a size of 7 mm TL. Diet overlap, as measured with the Schoener index, index, was found to be significant between both species at each mm-incremental size class.

82-000934 Stoner, A. W. THE INFLUENCE OF BENTHIC MACROPHYTES ON THE FORAGING BEHAVIOR OF PINFISH, *LAGODON RHOMBOIDES* (LINNAEUS). *J. Exp. Mar. Biol. Ecol.* 58(2-3):271-284. 26 Feb. 1982. SFA 27(2)

[Sea Educ. Assoc., P.O. Box 6, Woods Hole, MA 02543] Laboratory experiments showed that the number of amphipods consumed by juvenile pinfish *Lagodon rhomboides* (Linnaeus) decreased significantly with increasing seagrass biomass, but differences occurred among various macrophyte species. Consistently, *Halodule wrightii* Aschers. provided the least protection for amphipods from predation by pinfish, while equivalent standing crops of *Syringodium filiforme* Kütz provided the most protection. *Thalassia testudinum* Banks et König was intermediate in quality as a refuge. Small pinfish (25 to 67mm standard length) consumed more amphipods per unit time than large pinfish (48 to 67 mm standard length). The choice of amphipod prey by pinfish was a function of seagrass biomass, fish size, and prey density, but was independent of macrophyte species. The effect of macrophyte biomass on choice of prey was more pronounced in small pinfish than in large animals. Known distributional patterns of amphipods and pinfish are explained in light of the predation experiments, and the adaptive significance of habitat choice in epifaunal amphipods is discussed. Hypotheses based upon the results of the experiments are offered to explain geographic variation in the food habits of *Lagodon rhomboides*. Foraging behavior was shown to be a complex function of predator, prey, and habitat characteristics.

82-000935 Summers, G. L. FOOD OF ADULT LARGEMOUTH BASS IN A SMALL IMPOUNDMENT WITH DENSE AQUATIC VEGETATION. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:131-136. 1980[1981]. SFA 27(2)

[Okla. Fish. Res. Lab., Norman 73069] Stomachs of 240 adult largemouth bass (*Micropterus salmoides*) taken from a small impoundment with abundant aquatic vegetation, were evacuated and their contents examined. Thirty percent of the bass had empty stomachs. Crayfish, bluegill (*Lepomis macrochirus*), and young-of-year largemouth bass were the predominant food items. Electivity values (E) indicated negative selection for bluegill and positive selection for young bass. Dense, aquatic macrophytes are probably the major factor influencing the feeding behavior of these bass.

82-000936 Timmons, T. J. and O. Pawaputanon. RELATIVE SIZE RELATIONSHIP IN PREY SELECTION BY LARGEMOUTH BASS IN WEST POINT LAKE, ALABAMA-GEORGIA. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:248-252. 1980[1981]. SFA 27(2)

[Dep. Fish Allied Aquacult., Auburn Univ., Auburn, AL 36849] Largemouth bass (*Micropterus salmoides*) are able to feed on relatively large prey.

FOODS/FEEDING (CONTINUED)

82-000936 CONTINUED The relative size of prey, calculated as the ratio of prey length (or weight) to predator length (or weight), changed only slightly with increasing size of largemouth bass. Bluegills (*Lepomis macrochirus*), gizzard shad (*Dorsoma cepedianum*), and threadfin shad (*D. petenense*) were the most common fishes consumed by largemouth bass in West Point Lake. Bluegills were more often eaten by small largemouth bass (3 to 15 cm TL), while shad were eaten by larger ones (>15 cm TL). Regression equations for the sizes of bluegills and shad that largemouth bass consumed were calculated to predict the average size of prey for different sizes of largemouth bass. Largemouth bass could swallow bluegills at 0.4 times their length or shad at 0.5 times their length. The equations of Lawrence (1958) were corroborated by our study of size-selective predation in largemouth bass from West Point Lake.

82-000937 Vinyard, G. L.; R. W. Drenner and D. A. Hanzel. FEEDING SUCCESS OF HATCHERY-REARED KOKANEE SALMON WHEN PRESENTED WITH ZOOPLANKTON PREY. *Prog. Fish-Cult.* 44(1):37-39. Jan. 1982. SFA 27(2)
[Dept. Biol., Univ. Nev., Reno 89557]

82-000938 Warlow, A. D. and R. S. Oldham. TEMPORAL VARIATIONS IN THE DIET OF BROWN TROUT (*SALMO TRUTTA* L.) AND RAINBOW TROUT (*S. GAIRDNERI* R.) IN RUTLAND WATER. *Hydrobiologia* 88(1-2):199-206. 26 Mar. 1982. SFA 27(2)
[Sch. Life Sci., Leicester Polytech., Leicester, England]

82-000939 Webb, P. W. RESPONSES OF NORTHERN ANCHOVY, *ENGRAULIS MORDAX*, LARVAE TO PREDATION BY A BITING PLANKTIVORE, *AMPHIPRION PERCULA*. *NOAA Fish. Bull.* 79(4):727-735. Oct. 1981. SFA 27(2)
[Sch. Nat. Resour., Univ. Mich., Ann Arbor 48109]

82-000940 Witte-Maas, E. L. M. EGGSNATCHING: AN OBSERVATION ON THE FEEDING BEHAVIOUR OF *HAPLOCHROMIS BARBARAE* GREENWOOD, 1967(PISCES, CICHLIDAE). *Neth. J. Zool.* 31(4):786-789. Dec. 1981. SFA 27(2)
[c/o Drs. C.D.N. Barel, Dep. Morphol., Zool. Lab., PB9516, 2300 RA Leiden, The Netherlands]

82-000941 Worgan, J. P. and G. J. FitzGerald. DIEL ACTIVITY AND DIET OF THREE SYMPATRIC STICKLEBACKS IN TIDAL SALT MARSH POOLS. *Can. J. Zool.* 59(12):2375-2379. Dec. 1981. In English with French summ. SFA 27(2)
[Dep. Biol., Fac. Sci. Gen., Univ. Laval, PQ G1K 7P4, Canada] The activity patterns and diet of the adults of three sympatric sticklebacks, *Gasterosteus aculeatus*, *Gasterosteus wheatlandi*, and *Pungitius pungitius*, are compared to learn how three sympatric species share time and food resources. Catch data from unbaited traps indicate that all species are equally diurnal. Females of all species feed almost exclusively in the early morning. No periodicity was observed in the feeding of males compared with females, because males fed infrequently. The diets of the three species were similar though the importance of certain prey items varied with species and sex. Results show that resource partitioning along the dimensions of food type and time are of minor importance in explaining coexistence of the three species during their breeding season.

82-000942 Wright, D. I. THE PLANKTIVOROUS FEEDING BEHAVIOR OF WHITE CRAPPIE (*POMOXIS ANNULARIS*): FIELD TESTING A MECHANISTIC MODEL. *Ph.D. dissertation, Univ. Kans.* 150p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(8):3122. Feb. 1982. SFA 27(2)

FOODS/FEEDING (CONTINUED)

82-000943 Yoshiyama, R. M. and J. D. S. Darling. GRAZING BY THE INTERTIDAL FISH *ANOPLARCHUS PURPURESCENS* UPON A DISTASTEFUL POLYCHAETE WORM. *Environ. Biol. Fishes* 7(1):39-45. 15 Jan. 1982. SFA 27(2)
[Environ. Sci. Div., Oak Ridge Natl. Lab., P.O. Box X, Oak Ridge, TN 37830]

AGE AND GROWTH

82-000944 Ball, R. L. CHANGES IN YELLOW BASS GROWTH RATES AND DENSITY DURING THE FIRST TEN YEARS OF ITS ESTABLISHMENT IN MONROE RESERVOIR. *Proc. Indiana Acad. Sci.* 90:190. 1980(1981). Abstract only. SFA 27(2)
[Indiana Dep. Nat. Resour., Avoca 47420] Growth rates of yellow bass, *Morone mississippiensis*, in Monroe Reservoir have declined rapidly since the first native year class developed in 1969. At the third annulus, back-calculated growth of the 1969 year class averaged 26.2 cm, compared to 19.6 cm for the 1976 year class. Most of the loss of growth has occurred by the end of the second year of life. Growth during the first year of life prior to 1974 averaged 12.0 cm, while it dropped to an average of 9.7 cm in the following five years. Average growth increments during the second year of life decreased 2.1 cm during the same period. Growth in terms of annual length increments indicates that growth has not decreased steadily and is not inversely related to density of yellow bass, although density in terms of kg/ha. of yellow bass has increased over the 10 year study period. Although the size of yellow bass in the Monroe sportfishing catch was good initially (fish averaged 0.13 kg each in 1973 and 1974), the mean weight dropped to 0.10 kg in 1979. Reduced weight and presence of a bacterial infection in the adult population of this species was followed by a reduction in sportfishing harvest of yellow bass in 1979. Limited food supply seems to be the immediate cause of poor growth. Reduction of growth of larger bluegill, and both reduced growth and reduced abundance of yellow perch in Monroe, indicate a dearth of small crustaceans and larval insects for which these three species appear to be competing in the open areas of the lake. Also, a lack of open water predators, such as white bass and walleye, may have contributed to the decline in yellow bass growth rates.

82-000945 Beamish, R. J. and D. E. Chilton. PRELIMINARY EVALUATION OF A METHOD TO DETERMINE THE AGE OF SABLEFISH (*ANOPLOPOMA FIMBRIA*). *Can. J. Fish. Aquatic Sci.* 39(2):277-287. Feb. 1982. In English with French summ. SFA 27(2)
[Dep. Fish. Oceans, Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

82-000946 Boehlert, G. W. THE EFFECT OF PHOTOPERIOD AND TEMPERATURE ON LABORATORY GROWTH OF JUVENILE *SEBASTES DIPLOPROA* AND A COMPARISON WITH GROWTH IN THE FIELD. *NOAA Fish. Bull.* 79(4):789-794. Oct. 1981. SFA 27(2)
[Sch. Oceanogr., Oreg. State Univ., Mar. Sci. Cent., Newport 97365]

82-000947 Cailliet, G. M.; D. Kusher; L. Martin and P. Wolf. A REVIEW OF SEVERAL METHODS FOR AGING ELASMOBRANCHS. *Cal-Neva Wildl. Trans.* p. 52-61. 1981. SFA 27(2)
[Moss Landing Mar. Lab., Moss Landing, CA 95039]

82-000948 Gray, P. L.; J. F. Koerner and R. A. Marriott. THE AGE STRUCTURE AND LENGTH-WEIGHT RELATIONSHIP OF SOUTHEASTERN ALASKA COHO SALMON (*ONCORHYNCHUS KISUTCH*), 1969-1970. *Alaska Dep. Fish Game Inf. Leafl.*

AGE AND GROWTH (CONTINUED)

82-000948 CONTINUED No. 195. iv + 57p. Dec. 1981. SFA 27(2)
[Alaska Dep. Fish Game, Div. Commer. Fish., Southeast. Alaska Coho Res., Juneau]

82-000949 Harrell, R. M. and H. A. Loyacano, Jr. AGE, GROWTH AND SEX RATIO OF THE AMERICAN EEL IN THE COOPER RIVER, SOUTH CAROLINA. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:349-359. 1980[1981]. SFA 27(2)
[Dennis Wildl. Cent., S.C. Wildl. Mar. Resour. Dep., Bonneau 29431] Age-growth analysis was performed on *Anguilla rostrata* from 2 study sites on the Cooper River, South Carolina. Length ranged from 98 to 834mm and weight ranged from 1 to 1224g. Examination of otoliths gave mean age of 5.1 years with a range of 0-15 years. Length-weight relationship was established as: log w = -6.56 + 3.34 log (L). Eels were sexed by morphological and histological examination of gonad tissue. Males comprised only 1.6 percent of the population from Pinopolis Dam and 1.3 percent from Wadboo Creek. Eels smaller than 210mm could not be sexed.

82-000950 Harvey, G. and R. Fortin. CROISSANCE EN LONGUEUR ET EN POIDS DES BARBOTTES BRUNES *ICTALURUS NEBULOSUS* (LE SUEUR) CAPTURÉES À LA FRAYÈRE DE LA RIVIÈRE AUX PINS, PRÈS DE MONTRÉAL (QUÉBEC). [GROWTH IN LENGTH AND WEIGHT OF THE BROWN BULLHEAD *ICTULURUS NEBULOSUS* (LE SUEUR) CAPTURED IN THE SPAWNING GROUNDS IN RIVIÈRE AUX PINS, NEAR MONTREAL (QUEBEC).] *Can. J. Zool.* 60(1):24-30. Jan. 1982. In French with English summ. SFA 27(2)
[Serv. Amenage. Exploitation Faune, Minist. Loisir, Chasse Pêche, Jonquière, PQ G7X 8L6, Canada]

82-000951 Hashim, M. T. and A. A. Shakour. AGE DETERMINATION AND GROWTH STUDIES OF *LETHRINUS MAHSENA* AND *L. XANTHOCHILUS*. *Jeddah J. Mar. Res.* 1:11-20. 1981. SFA 27(2)
[Fac. Mar. Sci., King Abdulaziz Univ., Saudi Arabia]

82-000952 Hogler, S. R. and S. E. Belanger. ON THE USE OF VARIOUS FISH AGEING METHODOLOGIES. *Ohio J. Sci.* 82(2):4. 1982. Abstract only. SFA 27(2)
[Dep. Biol. Sci., Bowling Green State Univ., Bowling Green, OH 43403] Recent investigations concerning estimating ages of fish have indicated that the precision and accuaracy of an estimate is a function of the method employed, water chemistry and the intensity of fishing pressure applied to a stock. Age estimations of white suckers (*Catostomus commersoni*) and freshwater drum (*Aplodinotus grunniens*) from the Maumee River, Ohio, were compared using pectoral fin-rays, dorsal fin-rays and scales. Estimates were not consistent between methods. Age estimations of walleyes (*Stizostedion vitreum*), taken from Burt Lake, Michigan, were compared using pectoral and pelvic fin-rays, dorsal fin-spines, otoliths and scales. Estimates were not significantly different ($p>.05$) except for the pelvic fin-ray and otolith combination ($p<.05$). Chemistry of the water body and fishing pressure should be evaluated prior to the employment of an ageing method. A subjective merit analysis of each method can be performed based upon the ease of application, distinctiveness and interpretability of annuli, and confidence in the age estimation. For Burt Lake walleye otoliths and pectoral fin-rays were given the highest rating and pelvic fin-rays were given the lowest rating. A second technique should be used as an occasional check for the reliability of the chosen method.

82-000953 Jensen, A. J. and B. O. Johnsen. DIFFICULTIES IN AGING ATLANTIC SALMON (*SALMO SALAR*) AND BROWN TROUT (*SALMO TRUTTA*) FROM COLD RIVERS DUE TO LACK OF SCALES AS YEARLINGS. *Can. J. Fish. Aquatic Sci.*

AGE AND GROWTH (CONTINUED)

82-000953 CONTINUED 39(2):321-325. Feb. 1982. In English with French summ. SFA 27(2)
[Div. Wildl. Freshwater Fish, Elgesetergt. 10, N-7000 Trondheim, Norway]

82-000954 Kreuz, K. F.; A. V. Tyler; G. H. Kruse and R. L. Demory. VARIATION IN GROWTH OF DOVER SOLES AND ENGLISH SOLES AS RELATED TO UPWELLING. *Trans. Am. Fish. Soc.* 111(2):180-192. Mar. 1982. SFA 27(2)
[Dep. Fish. Wildl., Oreg. State Univ., Corvallis 97331]

82-000955 Sinclair, M.; A. Sinclair and T. D. Iles. GROWTH AND MATURATION OF SOUTHWEST NOVA SCOTIA ATLANTIC HERRING *(CLUPEA HARENGUS HARENGUS). Can. J. Fish. Aquatic Sci.* 39(2):288-295. Feb. 1982. In English with French summ. SFA 27(2)
[Dep. Fish. Oceans, Bedford Inst. Oceanogr., Dartmouth, NS B2Y 4A2, Canada]

82-000956 Smith, R. P. and J. L. Wilson. GROWTH COMPARISON OF TWO SUBSPECIES OF LARGEMOUTH BASS IN TENNESSEE PONDS. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:25-30. 1980[1981]. SFA 27(2)
[Dep. For. Wildl. Fish., Univ. Tenn., Knoxville 37901] A study was conducted to determine if any growth rate differences occurred between two subspecies of largemouth bass during the first 6 months of growth. Two ponds near Lenoir City, Tennessee, were partitioned into equal halves by a nylon fish barrier. Northern strain fingerlings (*Micropterus salmoides salmoides*) were stocked in one side of each pond and Florida bass (*M. s. floridanus*) in the other sides. *Micropterus salmoides salmoides* showed a significantly faster rate of growth (1.0% level) than *M. s. floridanus*. Mean coefficients of condition (K) and specific growth rates (G) were consistently higher for *M. s. salmoides* during the study period. Since the subspecies were grown in the same water under apparently similar environmental conditions but separated by a barrier, growth differences observed from the fingerling state (1 month old) to 5 months of age were thought to be genetic in nature.

82-000957 Thorson, T. B. and E. J. Lacy, Jr. AGE, GROWTH RATE AND LONGEVITY OF *CARCHARHINUS LEUCAS* ESTIMATED FROM TAGGING AND VERTEBRAL RINGS. *Copeia* 1982(1):110-116. 23 Feb. 1982. SFA 27(2)
[Sch. Life Sci., Univ. Nebr., Lincoln 68588] Data from eight long-term tagging-recapture records and counts of vertebral calcification rings of 15 individuals were combined to develop a model for age determination, growth rate and longevity for the population of *Carcharinus leucas* the occurs in the Lake Nicaragua-Rio San Juan System of Nicaragua and Costa Rica. The growth rate is relatively rapid in the first two years (18 and 16 cm per year), slows gradually to 12 and 11 cm per year and appears to remain at 9 or 10 cm per year for the later years of life. Females have been taken as much as 251 cm long, while males have reached only 214 cm. The proposed growth curve is based on males, except for some of the smallest individuals, so growth rate can only be surmised for large females, by extrapolation. The available evidence suggests that they reach their larger size mainly through longer life-aproximately 16 years for females of about 2.5 meters to about 12 years for males of maximum size.

82-000958 Turner, P. R. PROCEDURES FOR AGE DETERMINATION AND GROWTH RATE CALCULATIONS OF FLATHEAD CATFISH. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:253-262. 1980[1981]. SFA 27(2)
[Dep. Fish. Wildl. Sci., N. Mex. State Univ., Las Cruces 88003] Cross-sections cut from the articulating process (AP) of pectoral spines were used to determine age and back-calculate growth of 370 flathead catfish

AGE AND GROWTH (CONTINUED)

82-000958 CONTINUED (*Pylodictis olivaris*) from 2 Oklahoma reservoirs. The accuracy of this method was validated by the following: agreement between the number of annuli and known age of 16 fish; 1 new annulus formed in the pectoral spines of fish tagged in 1970 and recaptured in 1971; agreement between calculated length increments and known length increases of tagged fish; and agreement between assigned age and length frequencies of young fish. Pectoral AP sections were superior to dorsal AP sections for age determinations. Sole use of sections from the distal end of the basal recess of pectoral spines would have resulted in underestimation of age by 1 to 5 years in fish of 3 to 13 years of age.

82-000959 Vondracek, B.; L. R. Brown and J. J. Cech, Jr. COMPARISON OF AGE, GROWTH, AND FEEDING OF THE TAHOE SUCKER FROM SIERRA NEVADA STREAMS AND A RESERVOIR. *Calif. Fish Game* 68(1):36-46. Jan. 1982. SFA 27(2)
[Dep. Wildl. Fish. Biol., Univ. Calif., Davis 95616] The Tahoe sucker, *Catostomus tahoensis*, grew faster in a reservoir than in two tributary streams. Growth rates were evaluated both by comparison of back-calculated lengths using pectoral fin rays and by comparison of standard lengths at capture of age V suckers. Digestive tract fullness and energy content of the diets were not significantly different for fish in the streams or the reservoir, which indicated food availability was not a factor influencing the growth differential. Growing season length or increased maintenance metabolic costs for stream residents are likely temperature-related phenomena explaining observed growth rate differences.

82-000960 Warlen, S. M. AGE AND GROWTH OF LARVAE AND SPAWNING TIME OF ATLANTIC CROAKER IN NORTH CAROLINA. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:204-214. 1980[1981]. SFA 27(2)
[NMFS, Southeast Fish. Cent., Beaufort Lab., Beaufort, NC 28516] The age and growth of larval Atlantic croaker, *Micropogonias undulatus*, was determined from daily growth increments on their otoliths. Smaller and younger larvae were found offshore near probable spawning areas while larger and older larvae were found near shore and in the lower estuary. A Laird-Gompertz growth model, $L_{(t)} = 0.926 \exp\{2.876[1-\exp(-0.0428t)]\}$, described the growth of larvae to 82 days old. The age-specific growth rate, derived from this relationship, declined with fish age. Atlantic croaker spawned over a 5-month period from mid-September to late-February, with the majority probably spawning in October-November. Larvae were the same size, 9 to 11 mm SL, when they immigrated to the estuary in the period from late-October to mid-April, although mean age of fish entering in January and April (61 to 64 days) was almost twice that of fish entering earlier.

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC.

82-000961 Bailey, R. M. and G. R. Smith. ORIGIN AND GEOGRAPHY OF THE FISH FAUNA OF THE LAURENTIAN GREAT LAKES BASIN. *Can. J. Fish. Aquatic Sci.* 38(12):1539-1561. Dec. 1981. In English with French summ. SFA 27(2)
[Mus. Zool., Univ. Mich., Ann Arbor 48109]

82-000962 Chadwick, E. M. P. and W. J. Bruce. RANGE EXTENSION OF STEELHEAD TROUT (*SALMO GAIRDNERI*) IN NEWFOUNDLAND. *Nat. Can. (Que.)* 108(3):301-303. 1981. In English with French summ. SFA 27(2)
[Dep. Fish. Oceans, P.O. Box 5667, St. John's NF A1C 5X1, Canada]

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

82-000963 Crabtree, R. E. and J. M. Dean. THE STRUCTURE OF TWO SOUTH CAROLINA ESTUARINE TIDE POOL FISH ASSEMBLAGES. *Estuaries* 5(1):2-9. Mar. 1982. SFA 27(2)
[Va. Inst. Mar. Sci., Gloucester Point, VA 23062] The fish assemblages of two South Carolina estuarine tide pools located in the North Edisto River were sampled from June to October 1977, and during June and July 1978, by haul seine, lift net and channel net. The nekton was dominated numerically by *Fundulus heteroclitus*, *Leiostomus xanthurus*, *Menidia menidia* and *Anchoa mitchilli*. Oyster reef areas were dominated numerically by *Gobiosoma bosci* and *F. heteroclitus*. The relative abundance of tide pool fishes differs from deep water areas of the North Edisto River as described from otter trawls, but is similar to that described by others for South Carolina tidal creeks.

82-000964 Daniels, R. A. and J. H. Lipps. DISTRIBUTION AND ECOLOGY OF FISHES OF THE ANTARCTIC PENINSULA. *J. Biogeogr.* 9(1):1-9. Jan. 1982. SFA 27(2)
[N.Y. State Mus., Biol. Surv., Cult. Educ. Cent., Rm. 3132, Albany, NY 12230]

82-000965 Edwards, A. J. and H. R. Lubbock. THE SHARK POPULATION OF SAINT PAUL'S ROCKS. *Copeia* 1982(1):223-225. 23 Feb. 1982. SFA 27(2)
[Dove Mar. Lab., Cullercoats, Tyne and Wear, NE30 4PZ, U.K.]

82-000966 Ernst, M. E. and J. Nielsen. SJÆLDNE OG TRUEDE FERSKVANDSFISK I DANMARK. [RARE AND THREATENED FRESHWATER FISH IN DENMARK.] *Medd. Ferskvandsfiskerilab. Dan. Fish.-Havunders* 1/80. 70p. 1981. In Danish. SFA 27(2)
[Lysbrogade 52, DK-8600 Silkeborg, Denmark]

82-000967 Goodfellow, W. L., Jr. and J. R. Lebo. FISHES OF THE TOWN CREEK DRAINAGE BEDFORD COUNTY, PENNSYLVANIA AND ALLEGANY COUNTY, MARYLAND. *Proc. Pa. Acad. Sci.* 55(2):147-152. 1981. SFA 27(2)
[Appal. Environ. Lab., Frostburg State Coll., Gunter Hall, Frostburg, MD 21532]

82-000968 Guillen, G. J. and A. M. Landry. SPECIES COMPOSITION AND ABUNDANCE OF ICHTHYOPLANKTON AT BEACHFRONT AND SALTMARSH ENVIRONMENTS. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:388-403. 1980[1981]. SFA 27(2)
[Dep. Wildl. Fish Sci., Tex. A&M Univ., College Station 77843] Ichthyoplankton communities of Galveston, Texas barrier island environments were characterized from 22 January through 27 August 1979. Beachfront and saltmarsh sites were sampled with a Renfro beam trawl to determine seasonal and diel trends in species composition and abundance of subadult fishes. Beach and saltmarsh constituted important temporary habitats for many ichthyoplankton species. Most larvae initially penetrated beach and tidal pass habitats but sought nutrient-rich saltmarsh environs. The beachfront yielded the highest number of taxa while the saltmarsh produced the greatest catch per effort. Peak ichthyoplankton abundances at both sites occurred during winter and early spring. Day and night sampling at the beach yielded similar catch statistics while peak yields at the saltmarsh consistently occurred during the day.

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

82-000969 Guillory, V. LONGITUDINAL GRADIENTS OF FISHES IN THOMPSON CREEK, LOUISIANA. *Southwest. Nat.* 27(1):107-115. 19 Feb. 1982. SFA 27(2)
[La. Dep. Wildl. Fish. Mar. Res. Lab., P.O. Box 37, Grand Isle 70358]

82-000970 Heinrich, D. BEITRÄGE ZUR GESCHICHTE DER FISCHFAUNA IN SCHLESWIG-HOLSTEIN: ALLERÖDZEITLICHE FISCHRESTE VON KLEIN NORDENDE, KREIS PINNEBERG. [CONTRIBUTIONS TO THE HISTORY OF THE FISH FAUNA OF SCHLESWIG-HOLSTEIN: ALLERÖD FISH REMAINS FROM KLEIN NORDENDE, KREIS PINNEBERG.] *Zool. Anz.* 207(3-4):181-200. 1981. SFA 27(2)
[Inst. Haustierkd., Biol.-Zent. Univ., Olshausenstr. 40-60, D-2300 Kiel, West Germany]

82-000971 Kauffman, J. FISHERY RESOURCES OF THE SHENANDOAH VALLEY, VIRGINIA. *Proc. Annu. Meet. Potomac Chap. Am. Fish. Soc.* 5:74-89. 1981(1982). SFA 27(2)
[Va. Comm. Game Inland Fish., Richmond]

82-000972 Kozel, T. R.; G. K. Weddle; K. L. Welborn; J. T. Dailey; D. C. Dailey and M. W. Denner. A FISH FAUNAL SURVEY OF POSEY COUNTY, INDIANA. *Proc. Indiana Acad. Sci.* 90:446-453. 1980(1981). SFA 27(2)
[Dep. Biol., Indiana State Univ., Evansville 47712]

82-000973 Maitland, P. S. THE FRESHWATER FISH FAUNA OF THE FORTH AREA. *Forth Nat. Hist.* 4:33-48. 1979. SFA 27(2)
[Inst. Terrest. Ecol., Edinburgh, Scotland]

82-000974 Marenchin, G. L. and D. M. Sever. SURVEY OF THE FISHES OF THE ST. JOSEPH RIVER DRAINAGE IN ST. JOSEPH AND ELKHART COUNTIES, INDIANA. *Proc. Indiana Acad. Sci.* 90:454-460. 1980(1981). SFA 27(2)
[Dep. Biol., Saint Mary's Coll., Notre Dame, IN 46556]

82-000975 Matthews, W. J. and R. McDaniel. NEW LOCALITY RECORDS FOR SOME KANSAS FISHES, WITH NOTES ON THE HABITAT OF THE ARKANSAS DARTER (*ETHEOSTOMA CRAGINI*). *Trans. Kans. Acad. Sci.* 84:219-222. 1981. SFA 27(2)
[Dep. Zool., Univ. Okla., Norman 73019]

82-000976 Matthews, W. J. SMALL FISH COMMUNITY STRUCTURE IN OZARK STREAMS: STRUCTURED ASSEMBLY PATTERNS OR RANDOM ABUNDANCE OF SPECIES? *Am. Midl. Nat.* 107(1):42-54. Jan. 1982. SFA 27(2)
[Dep. Zool., Univ. Okla., Kingston 73439] The distribution and relative abundance of minnows and minnow-like fishes of small Ozark watersheds show patterns that could be attributed to interspecific interactions such as competition. Species that are common throughout most of the region are rare or absent in some streams, and certain species pairs appear to be mutually exclusive. Among 13 common species, morphologically distinct taxa tend to be common or abundant in more watersheds than species whose morphology is nearer to average. However, when compared to a neutral model of community structure based on randomn assembly of species, the actual assemblages of Ozark fishes included no more mutually exclusive species pairs than might result from chance. Overall, despite apparent patterns in field data, the mutual abundance of all 13 species over six watersheds was no more structured than could be explained by random action of laws of probability. Competition, or other biotic interactions, may limit the total number of common or abundant small fish species in Ozark streams, but interactions between particular species pairs does not seem to dominate structure of the fish assemblages.

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

82-000977 Midttun, L.; O. Nakken and A. Raknes. VARIASJONER I UTBREDELSEN AV TORSK I BARENTSHAVET I PERIODEN 1977-1981. [VARIATIONS IN THE GEOGRAPHICAL DISTRIBUTION OF COD IN THE BARENTS SEA IN THE PERIOD 1977-1981.] *Fisken Havet* 1981(4):1-16. 1981. In Norwegian with English summ. SFA 27(2)
[Fiskeridir. Havforskningsinst., Bergen, Norway]

82-000978 Nagelkerken, W. P. DISTRIBUTION AND ECOLOGY OF THE GROUPERS AND SNAPPERS OF THE NETHERLANDS ANTILLES. *Found. Sci. Res. Surinam Netherlands Antilles Publ.* No. 107. 71p. Sept. 1981. Available from Zool. Lab., Plompetorengracht 9, Utrecht, Netherlands. SFA 27(2)

82-000979 Phillips, P. C. ANNOTATED CHECKLIST OF FISHES AT JIQUILISCO BAY, EL SALVADOR. *Rev. Biol. Trop.* 29(1):45-58. July 1981. In English with Spanish summ. SFA 27(2)
[Esc. Cienc. Biol., Univ. Nac., Heredia, Costa Rica]

82-000980 Rosa-Molinar, E. and S. B. Ruth. FIRST RECORD OF THE PINK WORMFISH (*MICRODESMUS LONGIPINNIS*) IN ALABAMA WATERS. *J. Ala. Acad. Sci.* 52(4):220. Oct. 1981. SFA 27(2)
[Dep. Biol., Carver Res. Lab., Tuskegee Inst., AL 36088]

82-000981 Schmidt, R. E. NEW DISTRIBUTION RECORDS OF FRESHWATER FISHES IN NORTH CAROLINA. *J. Elisha Mitchell Sci. Soc.* 96(1):36-38. 1980. SFA 27(2)
[RD#4, Box 208, Newton, NJ 07860] *Notropis cornutus chrysocephalus* is reported for the first time from North Carolina. Four species (*Notropis spectrunculus, N. rubricroceus, Carassius auratus,* and *Etheostoma chlorobranchium*) are reported as new drainage records from the Pigeon River system (Tennessee River drainage), North Carolina.

82-000982 Schwartz, F. J. and M. Provancha. IDENTITY OF THE SCIAENIDS, DUMPY CROAKERS AND BULLNOSE SPOT IN NORTH CAROLINA. *Fla. Sci.* 45(suppl. 1):27-28. 1982. Abstract only. SFA 27(2)
[Inst. Mar. Sci., Univ. N.C., Morehead City 28557]

82-000983 Shaw, R. F. SEASONAL SPECIES COMPOSITION, DIVERSITY, SPATIAL DISTRIBUTIONS, AND TIDAL RETENTION AND TRANSPORT OF ICHTHYOPLANKTON IN THE SHEEPSCOT RIVER - BACK RIVER - MONTSWEAG BAY ESTUARINE SYSTEM, MAINE. *Ph.D. dissertation, Univ. Me.* 205p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(8):3074. Feb. 1982. SFA 27(2)

82-000984 Townsend, D. W. COMPARATIVE ECOLOGY AND POPULATION DYNAMICS OF LARVAL FISHES AND ZOOPLANKTON IN TWO HYDROGRAPHICALLY DIFFERENT AREAS ON THE MAINE COAST. *Ph.D. dissertation, Univ. Me.* 282p. 1981. From Diss. Abstr. Int. B Sci. Eng. 42(8):3075. Feb. 1982. SFA 27(2)

82-000985 Williams, C. D. and J. E. Williams. DISTRIBUTION AND STATUS OF NATIVE FISHES OF THE RAILROAD VALLEY SYSTEM, NEVADA. *Cal-Neva Wildl. Trans.* p. 48-51. 1981. SFA 27(2)
[Dep. Biol. Sci., Calif. State Univ., Sacramento 95819]

82-000986 Williams, J. E. and C. D. Williams. DISTRIBUTION AND STATUS OF FISHES OF THE GENUS *GILA* (CYPRINIDAE) IN THE NORTHWESTERN GREAT BASIN. *Cal-Neva Wildl. Trans.* p. 19-24. 1981. SFA 27(2)

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

82-000986 CONTINUED
[U.S. FWS, 1230 N Street, 14th Floor, Sacramento, CA 95814] The distribution and status of fishes of the genus *Gila* were determined in 36 endorheic basins of the northwestern Great Basin. Seventeen (47%) of the 36 basins contained native populations of *Gila*; represented by *G. bicolor*, *G. alvordensis*, and *G. boraxobius*. All basins inhabited by *Gila*, excepted the Alvord, contain *G. bicolo*. Undescribed endemic subspecies of *G. bicolor* occur in the Silver Lake/Fort rock, Summer, Alkali, Catlow, Guano, Goose Lake, and Dixie Basins. The large number of undescribed subspecies indicated the need for taxonomic surveys. Increased demand for water, associated with agricultural and energy developments, accents the need for ichthyological studies as seceral taxa are threatened with extinction. *Gila boraxobius*, *G. bicolor* subsp. (of Hutton spring in Alkali Basin), *G. bicolor* subsp. (of Summer Basin), and *G. b. vaccaceps* are especially in need of protection.

ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY

82-000987 Collins, J. P. and G. K. Meffe. ELIMINATION OF A GILA TOPMINNOW (*POECILIOPSIS O. OCCIDENTALIS*, POECILIIDAE) POPULATION AND OTHER IMPACTS OF FLOODING IN A SONORAN DESERT STREAM. *Proc. Desert Fishes Counc.* 12:75. 1980(1981). In English and Spanish. Abstract only. SFA 27(2)
[Dep. Zool., Ariz. State Univ., Tempe 85281]

82-000988 Deacon, J. E. EFFECTS OF THE LOW FLOW ON WOUNDFIN IN THE VIRGIN RIVER. *Proc. Desert Fishes Counc.* 12:79-80. 1980(1981). In English and Spanish. Abstract only. SFA 27(2)
[Dep. Biol. Sci., Univ. Nevada, Las Vegas]

82-000989 Edsall, C. C. and M. J. Mac. COMPARATIVE HATCHING SUCCESS OF LAKE TROUT EGGS IN LAKE MICHIGAN WATER AND WELL WATER. *Prog. Fish-Cult.* 44(1):47-48. Jan. 1982. SFA 27(2)
[Great Lakes Fish. Lab., U.S. FWS, Ann Arbor, MI 48105]

82-000990 FitzGerald, G. J. and J.-D. Dutil. EVIDENCE FOR DIFFERENTIAL PREDATION ON AN ESTUARINE STICKLEBACK COMMUNITY. *Can. J. Zool.* 59(12):2394-2395. Dec. 1981. In English with French summ. SFA 27(2)
[Dep. Biol., Univ. Laval, Ste-Foy, PQ G1K 7P4, Canada] The diet of the black-crowned night heron (*Nycticorax nycticorax*) feeding in June and July along the southern shore of the St. Lawrence Estuary was composed primarily of the threespine sticklebaok *Gasterosteus aculeatus*. Three other sticklebacks, *G. wheatlandi*, *Pungitius pungitius*, and *Apeltes quadracus* occur in areas where the birds feed but were not eaten. It is suggested that differential predation on *G. aculeatus* may diminish interspecific competition for nest sites where the four stickleback species co-occur on the breeding grounds.

82-000991 Fortin, R.; P. Dumont; H. Fournier; C. Cadieux and D. Villeneuve. REPRODUCTION ET FORCE DES CLASSES D'ÂGE DU GRAND BROCHET (*ESOX LUCIUS* L.) DANS LE HAUT-RICHELIEU ET LA BAIE MISSISQUOI. [REPRODUCTION AND AGE CLASS STRENGTH OF NORTHERN PIKE (*ESOX LUCIUS* L.) OF THE HAUT-RICHELIEU AND MESSISQUOI BAY.] *Can. J. Zool.* 60(2):227-240. Feb. 1982. In French with English summ. SFA 27(2)
[Dep. Sci. Biol., Univ. Québec, C.P. 8808, Montreal, PQ H3C 3P8, Canada] Captures of northern pike on the spawning grounds and measures of egg deposition showed that from 1975 to 1978 spawning occurred in April, after

ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY (CONTINUED)

82-000991 CONTINUED the onset of spring high waters and the warming of the water above 5-6°C. Maximal egg deposition occurs on abandoned meadows, pastures, and shrub-grass areas, in water 60 cm or less. In the Bleury Stream area, these substrates lie mostly between elevations 30 and 30.5 m. Water temperature influences the length of the spawning and incubation periods. Spawning, egg incubation, and growth of the young to a mean length of 20 mm require approximately 40 days. From 1970 to 1977, two strong year classes (1973 and 1976) were produced; they were both followed by a weak year class. Air temperatures in June, summer water levels (June-September), and also the strength of the preceding year class, had a determining effect on year class strength.

82-000992 Kock, R. L. PATTERNS OF ABUNDANCE VARIATION IN REEF FISHES NEAR AN ARTIFICIAL REEF AT GUAM. *Environ. Biol. Fishes* 7(2):121-136. 15 Mar. 1982. SFA 27(2)
[Div. Aquatic Wildl. Resour., P.O. Box 23367 GMF, Guam, Mariana Islands 96921]

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[Mar. Resour. Res. Inst., S.C. Dep. Wildl. Mar. Resour., Charleston 29412] The relative influence of various factors on ocean fishing success was evaluated for pink, *Oncorhynchus gorbuscha*, Chinook, *O. tshawytscha*, and coho, *O. kisutch*, salmon off Washington and Vancouver Island. In addition, an evaluation was made of the practicality of predictive models for ocean catch. For each species, predictive regression equations were developed and their reliability evaluated in terms of the average percentage error of predicted catches from actual catches. Pink salmon catches were significantly correlated with indices of brood year abundance and the average individual weight of fish caught in ternimal areas during the brood year. Average error of predicted catches ranged upward of ±25%. Success for chinook salmon in year *i* was highly associated with Columbia River hatchery releases of fall brood year groups *i*-3 and *i*-4, Canadian purse seine catches of immature chinook salmon in Canadian area 20 during August of year *i*-1, and troll catch per effort during the fall of year *i*-1. Washington troll and sport catches of chinook salmon were also significantly correlated with the amount of nominal fishing effort. Coho salmon catches were significantly associated with level of fishing effort, indices of brood year abundance of Columbia River wild coho salmon, and Columbia River jack returns the preceding year. The average error of predicted annual troll coho salmon catches off the central Washington coast was ±15% for 1966-75.

82-000994 Schom, C. B. and E. Halfon. KIN SELECTION AS A SALMONID SURVIVAL STRATEGY EXPLAINING MORTALITY AND VARIABLE GROWTH IN FAMILIES: A MODELING STUDY. *J. Theor. Biol.* 94(1):153-172. 7 Jan. 1982. SFA 27(2)
[Salmon Genet. Res. Prog., N. Am. Salmon Res. Cent., St. Andrews, NB E0G 2X0, Canada] Several studies have shown that Salmonid growth is plastic, which makes it difficult to determine the extent of genetic and environmental influences. A number of hypotheses have been suggested. Kin Selection, as proposed by Hamilton (1946), would require that each family is made up of two groups of individuals. One group would be programmed to die, the other to live. This difference is maintained, in the model, by defining one group as able to avoid predation more easily than the other. Potential survivial to 200 days was evaluated for differences in ability to avoid predation, rates of movement between two redds and the proportion of individuals of each type in a family. If a family was isolated for 200 days a larger number of individuals would survive if a 0.5 to 0.9 difference in fitness existed rather than if all individuals were of one fitness. The optimum proportions would be 550 to 950 more fit individuals out of 1000 total population. Migration reduces but does not eliminate the advantage as only when families

ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY (CONTINUED)

82-000994 CONTINUED mix immediately would a strategy having all individuals of extremely high fitness be advantageous. If this hypothesis is correct and genetically weak individuals are present, they will reduce the efficiency of restocking and aquaculture programs.

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[Dep. Zool., Univ. Göteborg, Box 25059, S-400 31 Göteborg, Sweden]

82-000996 Vinyard, G. L. VARIABLE KINEMATICS OF SACRAMENTO PERCH (*ARCHOPLITES INTERRUPTUS*) CAPTURING EVASIVE AND NONEVASIVE PREY. *Can. J. Fish. Aquatic Sci.* 39(1):208-211. Jan. 1982. In English with French summ. SFA 27(2)
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[Zool. Mus., Univ. Copenhagen, Copenhagen, Denmark]

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[All-Union Res. Inst. Mar. Fish. Oceanogr., Moscow, USSR]

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[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

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[Dep. Ichthyol., Aust. Mus., 6-8 College St., Sydney, N.S.W. 2000, Australia]

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[Dep. Biol., Calif. State Univ., Long Beach 90840]

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[Caspian Biol. Stn., Inst. Zool., Acad. Sci. Azerbaijan SSR, Baku, USSR]

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[Bernice P. Bishop Mus., Box 19000-A, Honolulu, HI 96819]

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[Rosenstiel Sch. Mar. Atmos. Sci., Univ. Miami, 4600 Rickenbacker Causeway, Miami, FL 33149]

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82-001028 Trewavas, E. GENERIC GROUPINGS OF TILAPIINI USED IN AQUACULTURE. *Aquaculture* 27(1):79-81. Feb. 1982. SFA 27(2)
[Br. Mus. (Nat. Hist.), Cromwell Rd., London SW7 5BD, England] The tilapias were formerly included in the genus *Tilapia*. Now only the substratebrooders retain the generic name *Tilapia*, e.g. *Tilapia sparrmanii, T. guineensis*. There are two main kinds of mouth-brooders, *Sarotherodon* (e.g *S. galilaeus*) and *Oreochromis* e.g. *O. mossambicus, O. niloticus, O. macrochir*). In *Sarotherodon* brooding is paternal or biparental (where known), in *Oreochromis* maternal. All are included, with a few other genera, in the Tribe Tilapiini and may be referred to colloquially as tilapias, with a small 't' and no italics.

82-001029 Valdez, R. A. STATUS OF THE DISTRIBUTION AND TAXONOMY OF *GILA CYPHA* IN THE UPPER COLORADO RIVER. *Proc. Desert Fishes Counc.* 12:53-68. 1980(1981). In English and Spanish. SFA 27(2)
[U.S. FWS, 764 Horizon Dr., Grand Junction, CO 81501] New populations of the endangered humpback chub, *Gila cypha*, were encountered in habitat assessment studies by the Colorado River Fisheries Project of the U.S. Fish

IDENTIFICATION, KEYS, CLASSIFICATION (CONTINUED)

82-001029 CONTINUED and Wildlife Service in 1979-80. These are located in Westwater Canyon and Cataract Canyon, Utah. A third new population is indicated in Debeque Canyon, but since the individuals of this population lack some of the pronounced features of the species, taxonomic verification is still pending. A fourth population, encountered by other investigators in 1977 in Black Rocks, Colorado, was also studied. No estimates of population abundances are presented. Taxonomic studies on individuals of each population continue in order to more clearly distinguish *G. cypha*, *G. robusta*, and *G. elegans*, and to subsequently facilitate their identification afield.

82-001030 Wilde, G. R. TEMPERATURE, SALINITY AND THE TAXONOMY OF THE DEATH VALLEY PUPFISHES (*CYPRINODON*). *Proc. Desert Fishes Counc.* 12:131. 1980(1981). Abstract only. SFA 27(2)
[Dep. Biol. Sci., Univ. Nev., Las Vegas] Published data for 40 morphometric and meristic characters for 15 populations of Death Valley *Cyprinodon* were subjected to a principal components analysis. The first principal component accounted for 38.4% of the total character variance. Characters with high loadings (correlations) on the first principal component were those known to be affected by temperature and salinity. A three-dimensional plot of the 15 *Cyprinodon* populations on the first three principal components indicated that the first principal component separates populations from warm, saline springs from populations inhabiting cooler, less saline springs. Therefore, I conclude that the first principal component represents character variation due to temperature and/or salinity. Character variation associated with the first principal component was removed from consideration. A phenogram based on the remaining 61.4% of the character variance was constructed. This phenogram shows the phenetic (=phenotypic) similarities between the 15 populations of *Cyprinodon*. The systematic relationships implied by this phenogram are very compatible with the currently recognized relationships among these fishes. This analysis lends credence to the long-time assumption by ichthyologists, that character differences between populations are indicative of genetic differences, even when correlated with temperature and/or salinity.

82-001031 Yabe, M. OSTEOLOGICAL REVIEW OF THE FAMILY ICELIDAE BERG, 1940, (PISCES; SCORPAENIFORMES), WITH COMMENT ON THE VALIDITY OF THIS FAMILY. *Bull. Fac. Fish. Hokkaido Univ.* 32(4):293-315. Nov. 1981. SFA 27(2)
[Lab. Mar. Zool., Fac. Fish., Hokkaido Univ., Hakodate, Japan]

PARASITES AND DISEASES-GENERAL

82-001032 Elsarnagawy, D. DISEASES OF DENNIS, *CHRYSOPHRYS AURATUS*, IN MARICULTURE AT RATTAMA-EGYPT. *Jeddah J. Mar. Res.* 1:71-77. 1981. SFA 27(2)
[Inst. Oceanogr. Fish., Acad. Sci., Cairo, Egypt]

82-001033 Giavenni, R. CONSIDERAZIONI SULLE PIÙ DIFFUSE FORME MORBOSE RISCONTRABILI A CARICO DEI PESCI ORNAMENTALI. I. PESCI. TROPICALI DI ACQUA DOLCE. [CONSIDERATIONS ON THE MOST FREQUENT ORNAMENTAL FISH DISEASES. I. TROPICAL FRESHWATER AQUARIUM FISHES. *Riv. It. Piscic. Ittiop.* 16(4):130-140. Oct.-Nov.-Dec. 1981. In Italian with English summ. SFA 27(2)
[Med. Vet., S.I.R.A.P., S.p.A., Via Murazzi, 30010 Pellestrina, Venezia, Italy]

PARASITES AND DISEASES-GENERAL (CONTINUED)

82-001034 Holloway, H. L., Jr. and N. T. Hagstrom. COMPARISON OF FOUR NORTH DAKOTA IMPOUNDMENTS AND FACTORS AFFECTING THE DEVELOPMENT OF IMPOUNDMENT PARASITOFAUNA. *Prairie Nat.* 13(3-4):85-93. Sept.-Dec. 1981. SFA 27(2)

[Biol. Dep., Univ. N. Dak., Grand Forks 58202] Four impoundments in North Dakota are compared with their source rivers in terms of parasite fauna. Lists of species found are presented and factors affecting the development of the parasite fauna after impoundment are proposed. Factors are based on differences in physical make-up of the impoundments and parasite types. The four factors proposed are: degree of environmental change at impoundment, amount of communication of the impoundment and river environments after impoundment, degree of contact with potential sources of new parasites, and the ability of individual parasite species to maintain a continutity of infection after impoundment.

82-001035 Hussein, S. A. and D. H. Mills. THE PREVALENCE OF 'CAULIFLOWER DISEASE' OF THE EEL, *ANGUILLA ANGUILLA* L., IN TRIBUTARIES OF THE RIVER TWEED, SCOTLAND. *J. Fish Dis.* 5(2):161-165. Mar. 1982. SFA 27(2)

[D. H. Mills: Dep. For. Nat. Resour., Univ. Edinburgh, Edinburgh EH9 3JU, Scotland]

82-001036 Miller, N. W. and M. R. Tripp. AN IMMUNOINHIBITORY SUBSTANCE IN THE SERUM OF LABORATORY HELD KILLIFISH, *FUNDULUS HETEROCLITUS* L. *J. Fish Biol.* 20(3):309-316. Mar. 1982. SFA 27(2)

[Dep. Microbiol., Univ. Miss. Med. Cent., Jackson 39216] Serum of the killifish, *Fundulus heteroclitus*, maintained under laboratory conditions for more than four weeks, contained a factor that depressed the immunocytoadherence response to SRBC. When serum was injected into immunocompetent fish 48h prior to antigen stimulation it was effective; when infected simultaneously with the antigen there was no effect. Fractionation of the serum by ultracentrifugation suggests that the inhibitor is either low or very low density lipoprotein. Hypoplysectomy decreased immune inhibition suggesting that the production of the inhibitor may be under the control of the pituitary.

82-001037 Miller, N. W. and M. R. Tripp. THE EFFECT OF CAPTIVITY ON THE IMMUNE RESPONSE OF THE KILLIFISH, *FUNDULUS HETEROCLITUS* L. *J. Fish Biol.* 20(3):301-308. Mar. 1982. SFA 27(2)

[Dep. Microbiol., Univ. Miss. Med. Cent., Jackson 39216] *Fundulus heteroclitus* maintained under laboratory for more than four weeks showed a significantly lower immunocytoadherence (rosette) response to thymus-dependent antigens (SRBC and DNP-BSA) than newly captured fish. There was no comparable effect on scale allograft rejection nor in the response to a thymus-independent antigen (DNP-Ficoll) as measured by the rosette response. This suggests that captivity has a differential effect on a sub-population of lymphocytes analogous to the T-helper cells of mammals.

82-001038 Scott, J. S. ALIMENTARY TRACT PARASITES OF HADDOCK (*MELANOGRAMMUS AEGLEFINUS* L.) ON THE SCOTIAN SHELF. *Can. J. Zool.* 59(12):2244-2252. Dec. 1981. In English with French summ. SFA 27(2)

[Mar. Fish. Div., Dep. Fish Oceans, Biol. Stn., St. Andrews, NB E0G 2X0, Canada]

BACTERIAL DISEASES

82-001039 Bowers, A. and J. B. Alexander. *IN VITRO* AND *IN VIVO* PASSAGE OF BACTERIA ACROSS RESTRICTED AREAS AND ISOLATED TISSUES OF TROUT, *SALMO TRUTTA* L. AND *S. GAIRDNERI* RICHARDSON. *J. Fish Dis.* 5(2):145-151. Mar. 1982. SFA 27(2)
[Dr. J. B. Alexander: Dep. Biol., Gardner St. Annexe, Univ. Salford, Salford M6 6WZ, England]

82-001040 Cipriano, R. C. ASSESSMENT OF THE ABILITY OF HOMEOTHERM IMMUNOGLOBULINS TO CONFER PASSIVE IMMUNITY IN POIKILOTHERM VERTEBRATES. *Fish Health News* 10(1):vi-vii. Jan. 1981. SFA 27(2)
[U.S. FWS, Natl. Fish Health Res. Lab., Kearneysville, WV 25430]

82-001041 Cipriano, R. C. FURUNCULOSIS IN BROOK TROUT: INFECTION BY CONTACT EXPOSURE. *Prog. Fish-Cult.* 44(1):12-14. Jan. 1981. SFA 27(2)
[U.S. FWS, Natl. Fish Health Res. Lab.,Rt. 3, Box 40E, Kearneysville, WV 25430]

82-001042 Cipriano, R. C. IMMUNIZATION OF BROOK TROUT (*SALVELINUS FONTINALIS*) AGAINST *AEROMONAS SALMONICIDA*: IMMUNOGENICITY OF VIRULENT AND AVIRULENT ISOLATES AND PROTECTIVE ABILITY OF DIFFERENT ANTIGENS. *Can. J. Fish. Aquatic Sci.* 39(1):218-221. Jan. 1982. In English with French summ. SFA 27(2)
[U.S. FWS, Natl. Fish Health Res. Lab., Rt. 3, Box 40E, Kearneysville, WV 25430]

82-001043 Eklund, M. W.; M. E. Peterson; F. T. Poysky; L. W. Peck and J. F. Conrad. BOTULISM IN JUVENILE COHO SALMON (*ONCORHYNCHUS KISUTCH*) IN THE UNITED STATES. *Aquaculture* 27(1):1-11. Feb. 1982. SFA 27(2)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98122] Botulism type E was first recognized as a major cause of fish mortality in the United States in 1979. This disease caused an estimated loss of 1 1/4 million juvenile salmon reared in earth-bottom ponds during the summer and fall of 1979 and 1980. The botulism outbreaks, preliminary laboratory results of experimental botulism, and precautions to be taken by fish farm employees are discussed.

82-001044 Giorgetti, G. and G. Ceschia. VIBRIOSIS IN RAINBOW TROUT, *SALMO GAIRDNERI* RICHARDSON, IN FRESH WATER IN NORTH-EASTERN ITALY. *J. Fish Dis.* 5(2):125-130. Mar. 1982. SFA 27(2)
[Ist. Zooprof. Spec. Venezie, Aggr. Univ. Padova, 33030 Basaldella di Campoformido, Via della Roggia 70, Udine, Italy]

82-001045 Hayashi, F.; I. Kunimine; K. Harada; M. Inoue and S. Mitsuhashi. [TRANSFORMATION METHOD OF FISH PATHOGEN *AEROMONAS HYDROPHILA* AND SULFANILAMIDE EXPRESSION OF HOST STRAINS.] *Bull. Jpn. Soc. Sci. Fish.* 47(12):1541-1544. Dec. 1981. In Japanese with English summ. SFA 27(2)
[Gunma Pref. Fish. Exp. Stn., 13, Shikishima, Maebashi 371, Japan]

82-001046 Kusuda, R.; A. Sugiyama and K. Kawai. [INFLUENCE OF MEDICATION ON STREPTOCOCCICOSIS AND VIBRIOSIS IN CULTURED AYU.] *Bull. Jpn. Soc. Sci. Fish.* 47(10):1309-1315. Oct. 1981. In Japanese with English summ. SFA 27(2)
[Fish Dis. Lab., Fac. Agric., Kochi Univ., Nankoku, Kochi 783, Japan]

BACTERIAL DISEASES (CONTINUED)

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[M.E. Rau: Inst. Parasitol., McGill Univ., Macdonald Coll., Ste Anne de Bellevue, PQ H9X 1C0, Canada]

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[C. Arme: Dep. Biol. Sci., Univ. Keele, Keele, Staffshire ST5 5BG, England]

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82-001075 Kulshrestha, A. K. and P. K. Mandal. PATHOLOGY OF GAS BUBBLE DISEASE IN TWO AIR-BREATHING CATFISHES (*CLARIAS BATRACHUS* LINN. AND *HETEROPNEUSTES FOSSILIS* BLOCH.). *Aquaculture* 27(1):13-17. Feb. 1982. SFA 27(2)
[Dep. Zool., Univ. Allahabad, Allahabad 211 002, India] Gross pathology in *Clarias batrachus* and *Heteropneustes fossilis*, and histopathology in the liver, intestine and kidney and abnormalities in erythrocyte count/mm^3 and haemoglobin g% of *C. batrachus* afflicted with gas bubble disease were studied over 96h. Histopathology and blood abnormalites in *H. fossilis* could not be observed due to heavy mortality. A tilt in the swimming posture and upward bend in the tail region were the first signs of the disease. Exophthalmia was noted and blebs containing gas bubbles appeared on the fins and other parts of the body. The blebs burst producing open lesions after 72 h, and the fins became necrotic. Histopathologic changes included, in the liver, vacuolation of cells, necrosis and cordal; in the intestine, lesions in the villi, degeneration of the submucosa, cellular exudate production in the lumen and air bubbles in the villi; and in the kidney, degeneration of tubules and glomeruli and necrosis of haemopoietic tissue. Erythrocyte count and haemoglobin content showed a consistent and significant fall from 12.87×10^6 to 6.91×10^6 and from 9.33 to 7.00 g%, respectively, up to 72h. Empty blood vessels were noted in the liver, intestine and kidney. Fish of both species regained normal swimming orientation, and erythrocyte count and haemoglobin content also showed recovery from the disease.

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[Div. Fish. Res., CSIRO Mar. Lab., P.O. Box 21, Cronulla, NSW 2230, Australia]

82-001079 McArthur, C. P. and S. Sengupta. A RAPID MICRO-METHOD FOR SCREENING EEL SERA FOR ANTIBODIES AGAINST THE DIGENEAN *TELOGASTER OPISTHORCHIS* MACFARLANE, 1945. *J. Fish Dis.* 5(1):67-70. Jan. 1982. SFA 27(2)
[Dep. Microbiol. Publ. Health, Mich. State Univ., East Lansing 48824]

82-001080 McVicar, A. H. and P. G. White. THE PREVENTION AND CURE OF AN INFECTIOUS DISEASE IN CULTIVATED JUVENILE DOVER SOLE, *SOLEA SOLEA* (L.). *Aquaculture* 26(3-4):213-222. Jan. 1982. SFA 27(2)
[Mar. Lab., Victoria Rd., Aberdeen, Scotland] The disease condition "Black Patch Necrosis" which causes serious mortalities of cultivated Dover sole through the development of areas of fin and skin necrosis, was shown to be infectious by co-habitation of diseased and healthy stocks. Spread of the disease throughtout an affected tank was rapid and high pathogenicity was evident, with most affected sole dying 1-2 days after the first appearance of clinical signs. Addition of a sand substrate to tanks both prevented occurrence of the disease and cured an established disease situation. No aetiological agent has yet been identified.

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[U.S. FWS, Fish Farm. Exp. Stn., Stuttgart, AR 72160]

82-001082 Molnar, K.; G. L. Chan and C. H. Fernando. SOME REMARKS ON THE OCCURRENCE AND DEVELOPMENT OF PHILOMETRID NEMATODES INFECTING THE WHITE SUCKER, *CATOSTOMUS COMMERSONI* LACÉPÈDE (PISCES: CATOSTOMIDAE), IN ONTARIO. *Can. J. Zool.* 60(3):443-451. Mar. 1982. In English with French summ. SFA 27(2)
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82-001086 Smith, C.; J. Morrison and H. Ramsey. PROLIFERATIVE KIDNEY DISEASE (PKD): FIRST OUTBREAK IN NORTH AMERICA. *Fish Health News* 10(1):iii-v. Jan. 1981. SFA 27(2)
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POLLUTION

82-001090 Bregazzi, P. R. and C. R. Kennedy. THE RESPONSES OF A PERCH, *PERCA FLUVIATILIS* L., POPULATION TO EUTROPHICATION AND ASSOCIATED CHANGES IN FISH FAUNA IN A SMALL LAKE. *J. Fish Biol.* 20(1):21-31. Jan. 1982. SFA 27(2)
[Univ. Reading, Dep. Agric. Horticult., Early Gate, Reading RG6 2AT, England] A number of parameters were measured in a population of perch whose numbers had declined steeply in a habitat subjected to increasing eutrophication, and these measurements were compared with those taken before the population decline. Contrary to expectation, no adaptive responses were identified. The growth rate of perch up to the age of III had only declined slightly, and there was a marked preponderance of young fish. Relative growth rate was consistent despite the population decline. No dominant year class was apparent. Mean instantaneous mortality rate and annual survival rate were calculated, and the length-weight relationship was analysed. Feeding strategy had not altered since an earlier study. A decline was seen in the percentage of perch maturing at early age. Ripeness coefficients and fecundity estimates were calculated. A previously documented spawning migration was confirmed. The absence of the expected adaptive changes is discussed.

82-001091 Cherry, D. S.; S. R. Larrick; J. D. Giattina; J. Cairns, Jr. and J. Van Hassel. INFLUENCE OF TEMPERATURE SELECTION UPON THE CHLORINE AVOIDANCE OF COLD-WATER AND WARMWATER FISHES. *Can. J. Fish. Aquatic Sci.* 39(1):162-173. Jan. 1982. In English with French summ. SFA 27(2)
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[Lab. Rech. Additifs Alimentaires, I.N.R.A., 180, chemin, de Tournefeuille, 31300 Toulouse, France]

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[Inst. Chem., Anal. Dep., Univ. Uppsala, S-751 21 Uppsala, Sweden]

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[Radiation Manage. Corp., Muddy Run Ecol. Lab., P.O. Box 10, Drumore, PA 17518]

82-001097 Holden, A. V. and G. Topping. REPORT ON FURTHER INTERCALIBRATION ANALYSES IN ICES POLLUTION MONITORING AND BASELINE STUDIES. *Int. Counc. Explor. Sea Coop. Res. Rep.* No. 108. 75p. Sept. 1981. SFA 27(2)
[Palægade 2-4, DK-1261 Copenhagen K, Denmark]

82-001098 International Council for the Exploration of the Sea. REPORTS ON ICES INTERCALIBRATIONS OF MERCURY AND CADMIUM IN SEA WATER, 1979. *Int. Counc. Explor. Sea Coop. Res. Rep.* No. 110. 55p. Nov. 1981. SFA 27(2)
[Palægade 2-4, 1261 Copenhagen K, Denmark]

82-001099 Kimmel, W. G.; C. A. Miller and T. C. Moon. THE IMPACT OF A DEEP-MINE DRAINAGE ON THE WATER QUALITY AND BIOTA OF A SMALL HARD-WATER STREAM. *Proc. Pa. Acad. Sci.* 55(2):137-141. 1981. SFA 27(2)
[Dep. Biol. Environ. Sci., Calif. State Coll., California, PA 15419] The impact of a point-source deep-mine discharge on the water quality, benthos, and fish of a small hard-water stream in southwestern Pennsylvania (USA) was

POLLUTION (CONTINUED)

82-001099 CONTINUED studied over a six-month period. The major water quality changes produced by the effluent were marked increases in total iron and sulfate and a moderate depression in pH. The macroinvertebrate communities downstream from the effluent were significantly depressed in numbers, biomass, and diversity. Significant negative linear relationships were found between total iron and the various macroinvertebrate community parameters. The fish communities downstream from the effluent were depauperate although individual population responses varied. Only the stoneroller, (*Campostoma anomalum*), was totally eliminated from the affected areas.

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[W. Va. Dep. Nat. Resour., Drawer C, Romney 26757]

82-001101 Liaw, W. K. and F. M. Atton. ACID RAIN ON NORTHERN LAKES: BACKGROUND STUDIES IN SASKATCHEWAN. *Musk-Ox* 28:26-42. 1981. In English with French summ. SFA 27(2)
[Saskatchewan Fish. Lab., 30 Campus Dr., Saskatoon S7N 0X1, Canada] This report examines water quality data compiled from 1938 to 1979 for over 600 Saskatchewan water bodies, and provides background information needed for the assessment of potential acid rain problems. Saskatchewan is unique in having waters encompassing the full range of total dissolved solids (TDS) found in inland waters. In spite of this vast variation, these lakes and streams can be grouped into four major zones which approximate the vegetation and soil zones of the province. These zones may be broadly denoted as Canadian Shield, Forest, Aspen Parkland, and Prairie. They have TDS up to 100, 200, 500 and over 500 ppm, respectively. The corresponding average alkalinities indicating the capacity to absorb acid are 18, 124, and 186, and 325 ppm. In general, lakes with lower TDS on the Shield have pH values between 6.5 and 7.5. More saline lakes have higher pH values, frequently between 8.0 and 9.0. Values as low as 5.56 and as high as 10.0 have been recorded. Northern Saskatchewan Shield lakes are similar to Ontario Shield lakes with respect to TDS and alkalinity, as well as watershed characteristics. They are sensitive to acidic fallout. Estimates of acidification rates, based on determinations of the lakes' buffering capacity, suggest that small, shallow Shield lakes with low alkalinity are particulary vulnerable to potential acid contamination. Data are needed on the pH and the buffering capacity of those lakes within some 350 km downwind of Fort McMurray and Cold Lakes, particularly those with the potential for fish spawning and nursery grounds. These findings generally establish the uncontaminated condition of Saskatchewan waters in respect of TDS, alkalinity, and pH against which future changes may be evaluated.

82-001102 Matthiessen, P.; P. J. Fox; R. J. Douthwaite and A. B. Wood. ACCUMULATION OF ENDOSULFAN RESIDUES IN FISH AND THEIR PREDATORS AFTER AERIAL SPRAYING FOR THE CONTROL OF TSETSE FLY IN BOTSWANA. *Pestic. Sci.* 13(1):39-48. Feb. 1982. SFA 27(2)
[Cent. Overseas Pest Res., Overseas Dev. Admin., College House, Wrights Lane, London W8 5SJ, England]

82-001103 Mehrle, P. M.; T. A. Haines; S. Hamilton; J. L. Ludke; F. L. Mayer and M. A. Ribick. RELATIONSHIPS BETWEEN BODY CONTAMINANTS AND BONE DEVELOPMENT IN EAST-COAST STRIPED BASS. *Trans. Am. Fish. Soc.* 111(2):231-241. Mar. 1982. SFA 27(2)
[Columbia Natl. Fish. Res. Lab., Rt. 1, Columbia, MO 65201]

82-001104 Nelson, J. A. PHYSIOLOGICAL OBSERVATIONS ON DEVELOPING RAINBOW TROUT, *SALMO GAIRDNERI* (RICHARDSON), EXPOSED TO LOW pH AND VARIED CALCIUM ION CONCENTRATIONS. *J. Fish Biol.* 20(3):359-372. Mar. 1982. SFA 27(2)

POLLUTION (CONTINUED)

82-001104 CONTINUED
[Dep. Zool., Univ. Wash., NJ-15 Seattle 98195] The extinction of piscine populations in waters acidified by atmospheric fallout of pollutants and runoff from coal strip mines usually occurs through recruitment failure. To determine mechanisms of recruitment failure, several physiological parameters of developing rainbow trout were monitored while fish were exposed to conditions of low pH and varied calcium ion concentrations. Cardiac rate, ossification, growth, tissue calcium concentrations, protein maturation, hatching, and mortality were examined. Results indicate a decreased cardiac rate, decreased rate of ossification, slower growth, less pigmentation, delayed hatching and increased mortality under conditions of low pH. Cardiac rate, hatching and mortality varied with the external calcium concentration.

82-001105 Neumann, D. A.; J. M. O'Connor; J. A. Sherk, Jr. and K. V. Wood. RESPIRATORY RESPONSE OF STRIPED BASS (*MORONE SAXATILIS*) TO SUSPENDED SOLIDS. *Estuaries* 5(1):28-39. Mar. 1982. SFA 27(2)
[Sch. Life Health Sci., Univ. Del., Newark 19711] Oxygen consumption rates were measured individually for mixed groups of male, female, and immature striped bass, *Morone saxatilis*, in filtered Patuxent River, Maryland, water and in filtered water containing suspensions of either fuller's earth or Patuxent River sediment. Oxygen consumption was determined at fixed swimming speeds at two temperatures, 15 and 22.5°C. Oxygen consumption of striped bass in filtered 15°C water increased as swimming speed increased. At 22.5°C, the same range of swimming speeds had no effect on rates of oxygen consumption. Similar data were obtained with fish swimming at the same speeds in water containing 0.79 g per liter fuller's earth particles (15°C), and among those swimming at 31.7 and 49.0 cm per s in water containing 1.32 g per l Patuxent River sediment (22.5°C). Male and female striped bass respiration rates were similar under all test conditions. At 15°C, striped bass oxygen consumption rates during exposure to fuller's earth while swimming at 8.6 and 31.7 cm per s did not differ from rates of fish swimming at the same speeds in filtered water. At 49.0 cm per s, rates were significantly depressed. Respiration rates of fish exposed to Patuxent River sediment at 22.5°C while swimming at 31.7 and 49.0 cm per s were significantly lower than those of fish in filtered water. Respiratory response of striped bass to suspended particle stress was manifested by depressed oxygen consumption. This is considered a short-term response to an acute stress. This response and the potential for hematological response to chronic suspended particle stress are discussed.

82-001106 Niemi, M. and I. Taipalinen. FAECAL INDICATOR BACTERIA AT FISH FARMS. *Hydrobiologia* 86(1-2):171-175. 16 Jan. 1982. SFA 27(2)
[Natl. Board Waters, P.O. Box 250, SF-00101 Helsinki 10, Finland]

82-001107 Soholt, L. F.; R. W. Vocke; V. A. Harris; M. J. Knight and B. Siskind. COAL COMBUSTION WASTE MANUAL: EVALUATING IMPACTS TO FISH AND WILDLIFE. *U.S. Fish Wildl. Serv.* FWS/OBS-81/05. xii + 151p. Aug. 1981. SFA 27(2)
[Div. Environ. Impact Stud., Argonne Natl. Lab., 9700 South Cass Ave., Argonne, IL 60439]

82-001108 Spigarelli, S. A.; R. M. Goldstein; W. Prepejchal and M. M. Thommes. FISH ABUNDANCE AND DISTRIBUTION NEAR THREE HEATED EFFLUENTS TO LAKE MICHIGAN. *Can. J. Fish. Aquatic Sci.* 39(2):205-315. Feb. 1982. In English with French summ. SFA 27(2)
[Ecol. Sci. Sect., Radiol. Environ. Res. Div., Argonne Natl. Lab.; Argonne, IL 60439]

POLLUTION (CONTINUED)

82-001109 Srivastava, P. N. and A. S. Narain. LEUCOCYTIC AND HAEMOSTATIC REACTIONS OF THE INDIAN CATFISH, *HETEROPNEUSTES FOSSILIS*, SUBJECTED TO ENVIRONMENTAL POLLUTION BY SEWAGE, FERTILISERS AND INSECTICIDES. *Acta Pharmacol. Toxicol.* 50(1):13-21. Jan. 1982. SFA 27(2)
[Dep. Zool., Univ. Gorakhpur, Gorakhpur 273001, India] Total and differential leucocyte counts, thrombocyte count and blood clotting time of fishes exposed up to 40 days to sewage and some of its individually reproduced chemical factors, fertilisers (urea, potash), chlorinated insecticides (BHC, endrin) and organophosphorus insecticides (monochrotophos, phosphamidon) indicate pathological disturbances involving injury and haemorrhage in tissues.

82-001110 Tervet, D. J. THE IMPACT OF FISH FARMING ON WATER QUALITY. *Water Pollut. Control.* 80(5):571-581. 1981. SFA 27(2)
[Solway River Purification Board, Scotland] The quantification of the problem of pollution caused by fish-farm effluents cannot be achieved through routine monitoring and has required a special study. A considerable reduction in water quality has been shown to occur on many occasions at a fish farm and these occasions were especially serious where the farm abstracted most or all of the water from a watercourse. Although in monitoring an ecosystem, there are innumerable variables that affect its performance, the extent of the reduction in quality has been shown to correlate closely with the weight of fish carried and the flow through the farm. The most significant conclusion that may be drawn from this work is that pollution is liable to be caused downstream from fish farms unless annual production rates of much less than 200 tonnes are accepted for each 1 m^3/s of available flow. The constraint is less serious as the residual flow in a watercourse increases but is significantly affected by the quality of water available. If fish farmers wish to continue to achieve the production rates that have been attained in the past, it may be necessary to install effluent treatment.

82-001111 Wynes, D. L. and T. E. Wissing. EFFECTS OF WATER QUALITY ON FISH AND MACROINVERTEBRATE COMMUNITIES OF THE LITTLE MIAMI RIVER. *Ohio J. Sci.* 81(5-6):259-267. Sept.-Nov. 1981. SFA 27(2)
[Dep. Environ. Sci., Nichols Coll., Dudley, MA 01570]

82-001112 Yoder, C. O. THE ROLE OF FISH COMMUNITY STRUCTURE IN ASSESSING WATER QUALITY IN OHIO'S RIVERS AND STREAMS. *Ohio J. Sci.* 82(2):99. 1982. Abstract only. SFA 27(2)
[Ohio Environ. Prot. Agency, Div. Surveillance Standards, Columbus 43215]

FISH KILLS

82-001113 Swanson, R. N. and J. H. Gillespie. ISOLATION OF INFECTIOUS PANCREATIC NECROSIS VIRUS FROM THE BLOOD AND BLOOD COMPONENTS OF EXPERIMENTALLY INFECTED TROUT. *Can. J. Fish. Aquatic Sci.* 39(1):225-228. Jan. 1982. In English with French summ. SFA 27(2)
[Dep. Microbiol., Uniformed Serv. Univ. Health Sci., Bethesda, MD 20814]

TOXICOLOGY; BIOASSAYS

82-001114 Becker, C. D. and D. W. Crass. EXAMINATION OF PROCEDURES FOR ACUTE TOXICITY TESTS WITH THE FATHEAD MINNOW AND COAL SYNFUEL BLENDS. *Arch.*

TOXICOLOGY; BIOASSAYS (CONTINUED)

82-001114 CONTINUED *Environ. Contam. Toxicol.* 11(1):33-40. 1982. SFA 27(2)
[Pac. Northwest. Lab., Richland, WA 99352]

82-001115 Belanger, S. E. and K. Schurr. THE EFFECTS OF ASBESTOS ON LARVAL COHO SALMON. *Ohio J. Sci.* 82(2):4. 1982. Abstract only. SFA 27(2)
[Dep. Biol. Sci., Bowling Green State Univ., Bowling Green, OH 43403] Asbestos is a naturally occurring, fibrous mineral with substantial deposits in North America. Through the processes of weathering and human activity, asbestos fibers are released into aquatic habitats. Asbestos poses a potentially major threat to aquatic life. In order to evaluate this threat, coho salmon larvae (*Oncorhynchus kisutch*) were chosen as an experimental model. Fertilized eggs obtained from the Platte River Fish Hatchery, Michigan, were incubated under standard laboratory conditions. Upon hatching, the larvae were divided into groups of control and experimental fish. The experimental population was exposed to concentrations of asbestos similar to those reported in the Great Lakes. The experiment was terminated after 40 days. Acute mortality was comparable for both groups. Control fish displayed normal behavior and physical development. Asbestos treated fish exhibited abnormal swimming behavior and developmental aberations such as distentions of the ceolomic cavity and gross tissue hypertrophy in the gill region. Cytological examination revealed extensive tissue hyperatrophy and distortion of the lateral line organ in experimental larvae. Asbestos fibers were present in many of the tissues of treated fish. Asbestos may represent a new environmental hazard whose effects on aquatic life must be further explored.

82-001116 Cairns, M. A.; R. R. Garton and R. A. Tubb. USE OF FISH VENTILATION FREQUENCY TO ESTIMATE CHRONICALLY SAFE TOXICANT CONCENTRATIONS. *Trans. Am. Fish. Soc.* 111(1):70-77. Jan. 1982. SFA 27(2)
[U.S. EPA, 1350 Southeast Goodnight Ave., Corvallis, OR 97333]

82-001117 Colgan, P. W.; J. A. Cross and P. H. Johansen. GUPPY BEHAVIOR DURING EXPOSURE TO A SUB-LETHAL CONCENTRATION OF PHENOL. *Bull. Environ. Contam. Toxicol.* 28(1):20-27. Jan. 1982. SFA 27(2)
[Dep. Biol., Queen's Univ., Kingston, ON K7L 3N6, Canada]

82-001118 Dutta, H. M.; S. B. Lall and A. Z. Haghighi. BIOCHEMICAL AND ELECTROPHORETIC MONITORING OF SERUM PROTEIN AND ENZYMATIC ABERRATIONS IN BLUE GILLS-*LEPOMIS MACROCHIRUS*, CHALLENGED BY VARIOUS DOSES OF METHYL MERCURY CHLORIDE. *Ohio J. Sci.* 82(2):99. 1982. Abstract only. SFA 27(2)
[Dep. Biol. Sci., Kent State Univ., Kent, OH 44242]

82-001119 Hanna, P. J. EFFECTS ON SPERMATOGENESIS IN THE GUPPY *POECILIA RETICULATA* BY PROLONGED EXPOSURE TO TRIMETHYLPHOSPHATE. *Bull. Environ. Contam. Toxicol.* 28(1):28-32. Jan. 1982. SFA 27(2)
[Div. Biol. Health Sci., Deakin Univ., Victoria 3217, Australia]

82-001120 Holcombe, G. W.; G. L. Phipps and J. T. Fiandt. EFFECTS OF PHENOL, 2,4-DIMETHYLPHENOL, 2,4-DICHLOROPHENOL, AND PENTACHLOROPHENOL ON EMBRYO, LARVAL, AND EARLY-JUVENILE FATHEAD MINNOWS (*PIMEPHALES PROMELAS*). *Arch. Environ. Contam. Toxicol.* 11(1):73-78. 1982. SFA 27(2)
[U.S. EPA, Environ. Res. Lab., 6201 Congdon Blvd., Duluth, MN 55804] Embryos of fathead minnows were more resistant to phenol, 2,4-dimethylphenol (2,4-DMP), 2,4-dichlorophenol (2,4-DCP), and pentachlorophenol (PCP) than were larval or juvenile life stages. Growth of 28-day-old fish was the most sensitive indicator of stress during exposures to phenol, 2,4-DMP, and PCP, whereas survival was the most sensitive indicator of toxic effects from 2,4-DCP exposure. Based on these effects, the estimated maximum acceptable toxicant concentration for fathead minnows in Lake Superior water lies

TOXICOLOGY; BIOASSAYS (CONTINUED)

82-001120 CONTINUED between 1,830 and 3,570 µg/L for phenol; 1,970 and 3,110 µg/L for 2,4-DMP; 290 and 460 µg/L for 2,4-DCP; and 44.9 and 73.0 µg/L for PCP.

82-001121 Hose, J. E.; J. B. Hannah; D. DiJulio; M. L. Landolt; B. S. Miller; W. T. Iwaoka and S. P. Felton. EFFECTS OF BENZO(A)PYRENE ON EARLY DEVELOPMENT OF FLATFISH. *Arch. Environ. Contam. Toxicol.* 11(2):167-171. 1982. SFA 27(2)
[Moore Lab. Zool., Occidental Coll., 1600 Campus Rd., Los Angeles, CA 90041]

82-001122 Huey, D. W.; M. C. Wooten; L. A. Freeman and T. L. Beitinger. EFFECT OF pH AND CHLORIDE ON NITRITE-INDUCED LETHALITY IN BLUEGILL *(LEPOMIS MACROCHIRUS). Bull. Environ. Contam. Toxicol.* 28(1):3-6. Jan. 1982. SFA 27(2)
[T.L. Beitinger: Dep. Biol. Sci., North Tex. State Univ., Denton, TX 76203]

82-001123 Khangarot, B. S. HISTOPATHOLOGICAL CHANGES IN THE BRANCHIAL APPARATUS OF *PUNTIUS SOPHORE* (HAMILTON) SUBJECTED TO TOXIC DOSES OF ZINC. *Arch. Hydrobiol.* 93(3):352-358. 1982. In English with German summ. SFA 27(2)
[Dep. Anthropol., Univ. Delhi, Delhi 110 007, India]

82-001124 Kumaraguru, A. K.; F. W. H. Beamish and H. W. Ferguson. DIRECT AND CIRCULATORY PATHS OF PERMETHRIN (NRDC-143) CAUSING HISTOPATHOLOGICAL CHANGES IN THE GILLS OF RAINBOW TROUT, *SALMO GAIRDNERI* RICHARDSON. *J. Fish Biol.* 20(1):87-91. Jan. 1982. SFA 27(2)
[Dep. Zool., Univ. Guelph, Guelph, ON N1G 2W1, Canada] Rainbow trout were exposed to sublethal concentrations of Permethrin in water (0.09, 0.18 and 0.35µg 1^{-1}) and in food (85, 180 and 350µg kg^{-1} dry diet) in 20-40 day experiments. Histological changes in the gills included epithelial separation of necrosis, mucus cell hyperplasia, clubbing of epithelial cells or hyperplasia and fusion of adjacent secondary lamellae. these changes were noted in all fish, suggesting that the pesticide or its metabolites reached the gills not only directly through the water, but also indirectly via the circulation.

82-001125 Matthiessen, P. and R. J. Roberts. HISTOPATHOLOGICAL CHANGES IN THE LIVER AND BRAIN OF FISH EXPOSED TO ENDOSULFAN INSECTICIDE DURING TSETSE FLY CONTROL OPERATIONS IN BOTSWANA. *J. Fish Dis.* 5(2):153-159. Mar. 1982. SFA 27(2)
[Cent. Overseas Pest Res., 56 Gray's Inn Rd., London WC1X 8LU, England]

82-001126 Miller, T. G. and W. C. Mackay. RELATIONSHIP OF SECRETED MUCUS TO COPPER AND ACID TOXICITY IN RAINBOW TROUT. *Bull. Environ. Contam. Toxicol.* 28(1):68-74. Jan. 1982. SFA 27(2)
[Dep. Zool., Univ. Alberta, Edmonton, AB T6G 2E9, Canada]

82-001127 Muramoto, S. INFLUENCE OF COMPLEXANS (NTA, EDTA) ON THE TOXICITY OF TRIVALENT CHROMIUM (CHROMIUM CHLORIDE, SULFATE) AT LEVELS LETHAL TO FISH. *J. Environ. Sci. Health A Environ. Sci. Eng. (Marcel Dekker, Inc., N.Y.)* 16(6):605-610. 1981. SFA 27(2)
[Inst. Agric. Biol. Sci., Okayama Univ., Kurashiki 710, Japan]

TOXICOLOGY; BIOASSAYS (CONTINUED)

82-001128 Muramoto, S. REDUCTIONS OF Cd IN Cd-CONTAMINATED FISH BY LONG-TERM EXPOSURE TO EDTA OR FRESH-WATER. *J. Environ. Sci. Health A Environ. Sci. Eng. (Marcel Dekker, Inc., N.Y.)* 17(1):67-74. 1982. SFA 27(2)
[Inst. Agric. Biol. Sci., Okayama Univ., Kurashiki 710, Japan]

82-001129 Nava, M. E. and F. R. Engelhardt. INDUCTION OF MIXED FUNCTION OXIDASES BY PETROLEUM IN THE AMERICAN EEL, *ANGUILLA ROSTRATA*. *Arch. Environ. Contam. Toxicol.* 11(2):141-145. 1981. SFA 27(2)
[F.R. Engelhardt: Dep. Biol., Univ. Ottawa, Ottawa, ON K1N 6N5, Canada]

82-001130 Niimi, A. J. and C. A. McFadden. UPTAKE OF SODIUM PENTACHLOROPHENATE (NaPCP) FROM WATER BY RAINBOW TROUT (*SALMO GAIRDNERI*) EXPOSED TO CONCENTRATIONS IN THE ng/L RANGE. *Bull. Environ. Contam. Toxicol.* 28(1):11-19. Jan. 1982. SFA 27(2)
[Great Lakes Biolimnol. Lab., Can. Cent. Inland Waters, 867 Lakeshore Rd., Burlington, ON L7R 4A6, Canada]

82-001131 Nystrom, R. R. and G. Post. CHRONIC EFFECTS OF AMMONIA-STRIPPED OIL SHALE RETORT WATER ON FISHES, BIRDS, AND MAMMALS. *Bull. Environ. Contam. Toxicol.* 28(3):271-276. Mar. 1982. SFA 27(2)
[Dep. Fish. Wildl. Biol., Colo. State Univ., Fort Collins 80523]

82-001132 Oikari, A. O. J. and T. Nakari. KRAFT PULP MILL EFFLUENT COMPONENTS CAUSE LIVER DYSFUNCTION IN TROUT. *Bull. Environ. Contam. Toxicol.* 28(3):266-270. Mar. 1982. SFA 27(2)
[Dep. Zool., Div. Physiol., Univ. Helsinki, SF-00100 Helsinki 10, Finland]

82-001133 Payne, J. F. METABOLISM OF COMPLEX MIXTURES OF OIL SPILL SURFACTANT COMPOUNDS BY A REPRESENTATIVE TELEOST (*SALMO GAIRDNERI*), CRUSTACEAN (*CANCER IRRORATUS*), AND MOLLUSC (*CHLAMYS ISLANDICUS*). *Bull. Environ. Contam. Toxicol.* 28(3):277-280. Mar. 1982. SFA 27(2)
[Res. Resour. Serv., Dep. Fish. Oceans, P.O. Box 5667, St. John's, NF A1C 5X1, Canada]

82-001134 Reichert, W. L. and U. Varanasi. METABOLISM OF ORALLY ADMINISTERED NAPHTHALENE IN SPAWNING ENGLISH SOLE (*PAROPHYRS VETULUS*). *Environ. Res.* 27(2):316-324. Apr. 1982. SFA 27(2)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

82-001135 Ridlington, J. W.; D. E. Chapman; B. L. Boese and V. G. Johnson. PETROLEUM REFINERY WASTEWATER INDUCTION OF THE HEPATIC MIXED-FUNCTION OXIDASE SYSTEM IN PACIFIC STAGHORN SCULPIN. *Arch. Environ. Contam. Toxicol.* 11(1):123-127. 1982. SFA 27(2)
[Northrop Serv., Inc., 200 S.W. 35th Street, Corvallis, OR 97330]

82-001136 Schultz, M. E. and R. J. Schultz. INDUCTION OF HEPATIC TUMORS WITH 7, 12-DIMETHYLBENZ[A]ANTHRACENE IN TWO SPECIES OF VIVIPAROUS FISHES (GENUS *POECILIOPSIS*). *Environ. Res.* 27(2):337-351. Apr. 1982. SFA 27(2)
[Biol. Sci. Group, Univ. Conn., Storrs 06268]

82-001137 Shubat, P. J.; S. H. Poirier; M. L. Knuth and L. T. Brooke. ACUTE TOXICITY OF TETRACHLOROETHYLENE AND TETRACHLOROETHYLENE WITH DIMETHYLFORMAMIDE TO RAINBOW TROUT (*SALMO GAIRDNERI*). *Bull. Environ.*

TOXICOLOGY; BIOASSAYS (CONTINUED)

82-001137 CONTINUED *Contam. Toxicol.* 28(1):7-10. Jan. 1982. SFA 27(2)
[Cent. Lake Superior Environ. Stud., Univ. Wis., Superior 54880]

82-001138 Singh, B. B. and A. S. Narain. ACUTE TOXICITY OF THIODAN TO CATFISH (*HETEROPNEUSTES FOSSILIS*). *Bull. Environ. Contam. Toxicol.* 28(1):122-127. Jan. 1982. SFA 27(2)
[Dep. Zool., Univ. Gorakhpur, Gorakhpur 273001, India]

82-001139 Solangi, M. A. and R. M. Overstreet. HISTOPATHOLOGICAL CHANGES IN TWO ESTUARINE FISHES, *MENIDIA BERYLLINA* (COPE) AND *TRINECTES MACULATUS* (BLOCH AND SCHNEIDER), EXPOSED TO CRUDE OIL AND ITS WATER-SOLUBLE FRACTIONS. *J. Fish Dis.* 5(1):13-35. Jan. 1982. SFA 27(2)
[R.M. Overstreet: Gulf Coast Res. Lab., Ocean Springs, MS 39564]

82-001140 Solbakken, J. E.; A. H. Knap and K. H. Palmork. DISPOSITION OF (9-^{14}C) PHENANTHRENE IN A SUBTROPICAL MARINE TELEOST (*HAEMULON SCIURUS*). *Bull. Environ. Contam. Toxicol.* 28(3):285-289. Mar. 1982. SFA 27(2)
[Inst. Mar. Res., Nordnesparken 2, 5011-Bergen, Norway]

82-001141 Sullivan, J. R. and J. J. Delfino. THE DETERMINATION OF MERCURY IN FISH. *J. Environ. Sci. Health A Environ. Sci. Eng. (Marcel Dekker, Inc. N.Y.)* 17(2):265-275. 1982. SFA 27(2)
[J. J. Delfino: Lab. Hygiene, 465 Henry Mall, Univ. Wis., Madison 53706]

82-001142 Szeto, S. Y. and S. B. Holmes. THE LETHAL TOXICITY OF MATACIL ® 1.8F TO RAINBOW TROUT AND ITS *IN VIVO* METABOLISM. *J. Environ. Sci. Health B Pestic. Food Contam. Agric. Wastes (Marcel Dekker, Inc., N.Y.)* 17(1):51-61. 1982. SFA 27(2)
[Res. Stn., Agric. Can., 6660 N.W. Marine Dr., Vancouver, BC V6T 1X2, Canada] Fingerling rainbow trout (*Salmo gairdneri* Richardson) were used to determine the lethal toxicity of Matacil ® 1.8F and Matacil ® 1.8D ready-to-use formulations. The 96-h LC_{50}s were 21.3 mg/ℓ for water-based Matacil ® 1.8 F; 29.1 mg/ℓ for oil-based Matacil ® 1.8 F; and 0.36 mg/ℓ for Matacil ® 1.8D. Aminocarb (4-dimethylamino-m-tolyl N-methylcarbamate) and MA (4-methylamino-m-tolyl N-methylcarbamate) were detected in fish tissue 96h after exposure. More than 50% of the total residue (Aminocarb + MA) were the parent compound. The bioaccumulation ratio ranged from 1.70 to 3.32 at different concentrations of aminocarb. Both aminocarb and MA were rapidly eliminated after the fish had been transferred to clean water; the total residue declined by more than 90% in 72h and became non-detectable in 96h.

82-001143 Taylor, M. C.; A. Demayo and K. W. Taylor. EFFECTS OF ZINC ON HUMANS, LABORATORY AND FARM ANIMALS, TERRESTRIAL PLANTS, AND FRESHWATER AQUATIC LIFE. *Crit. Rev. Environ. Control* 12(2):133-181. 1982. SFA 27(2)
[Inland Waters Dir., Environ. Conserv. Serv., Dep. Environ., Ottawa, ON, Canada]

82-001144 Thomas, P.; M. Bally and J. M. Neff. ASCORBIC ACID STATUS OF MULLET, *MUGIL CEPHALUS* LINN., EXPOSED TO CADMIUM. *J. Fish Biol.* 20(2):183-196. Feb. 1982. SFA 27(2)

TOXICOLOGY; BIOASSAYS (CONTINUED)

82-001144 CONTINUED
[Univ. Tex., Mar. Sci. Inst., Port Aransas 78373] The effects of acute and chronic cadmium exposures on ascorbic acid concentrations and cadmium accumulation in the tissues of juvenile mullet, *Mugil cephalus*, are described. Hepatic ascorbic acid reserves were maintained in untreated mullet fed a diet containing ascorbate, but decreased 60% in individuals exposed to 10mg Cd l^{-1} for six weeks. Ascorbic acid depletion was accompanied by a massive accumulation of cadmium in the liver. Similar changes were found in gill tissue. In contrast, ascorbic acid concentrations were largely unaffected in kidney tissue which had a limited capacity to accumulate the metal. There were marked fluctuations of ascorbic acid levels in the brain. Only small amounts of cadmium were accumulated by this tissue. These results indicate that in mullet liver, gill and brain ascorbic acid stores may be depleted during chronic cadmium poisoning.

82-001145 Voss, Sh. D.; D. W. Shelton and J. D. Hendricks. EFFECTS OF DIETARY AROCLOR 1254 AND CYCLOPROPENE FATTY ACIDS ON HEPATIC ENZYMES IN RAINBOW TROUT. *Arch. Environ. Contam. Toxicol.* 11(1):87-91. 1982. SFA 27(2)
[Dep. Food Sci. Technol., Oreg. State Univ., Corvallis 97331]

82-001146 Wakabayashi, M.; M. Kikuchi; A. Sato and T. Yoshida. [THE RELATIONSHIP BETWEEN EXPOSURE CONCENTRATION AND BIOACCUMULATION OF SURFACTANTS.] *Bull. Jpn. Soc. Sci. Fish.* 47(10):1383-1387. Oct. 1981. In Japanese with English summ. SFA 27(2)
[Tokyo Metro. Res. Inst. Environ. Prot., 7-1, Yurakucho-2, Chiyoda, Tokyo 100, Japan]

82-001147 Watson, T. A.; P. A. G. Tilley; B. A. McKeown and G. H. Geen. *IN VITRO* EFFECTS OF ACEPHATE ON CARBONIC ANHYDRASE ACTIVITY IN THE BLOOD AND GILLS OF RAINBOW TROUT, *SALMO GAIRDNERI*. *J. Environ. Sci. Health B Pestic. Food Contam. Agric. Wastes (Marcel Dekker, Inc., N.Y.)* 17(1):63-75. 1982. SFA 27(2)
[B.C. Hydro, 555 W. Hastings St., EG-25, Box 12121, Vancouver, BC V6B 4T6, Canada] Acephate, a water-soluble organophosphate pesticide used to control terrestrial insect pests, may enter aquatic ecosystems in the course of its use and adversely affect fish populations. The *in vitro* effects of this insecticide on gill and red blood cell (RBC) carbonic anyhdrase (CA) activity in rainbow trout were investigated over a range of 100 mg/l (0.55 mM) to 50,000 mg/l (273 mM) to assess the manner in which acephate might affect respiratory capacity in exposed fish. Concentrations required to produce 50% inhibition of CA activity in the gill and RBC preparations were 38,000 mg/l (207 mM) and 8,900 mg/l (48 mM) respectively. The toxic action of acephate may be related to inhibition of CA activity in the blood and gills with resultant disturbances of respiratory capacity and salt balance.

82-001148 Weis, P. and J. S. Weis. TOXICITY OF THE PCBs AROCLOR 1254 AND 1242 TO EMBRYOS AND LARVAE OF THE MUMMICHOG, *FUNDULUS HETEROCLITUS*. *Bull. Environ. Contam. Toxicol.* 28(3):298-304. Mar. 1982. SFA 27(2)
[Dep. Anat., Coll. Med. Dent., Newark, NJ 07103]

82-001149 Wildish, D. J. and J. K. Elner. ABSENCE OF LONG-TERM CHANGES IN THE MICROBIOLOGY OF FRESHWATER PONDS TREATED WITH MATACIL. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1049. iii + 17p. Jan. 1982. In English with French summ. SFA 27(2)
[Biol. Stn., St. Andrews, NB E0G 2X0, Canada]

TOXICOLOGY; BIOASSAYS (CONTINUED)

82-001150 Zakitis, L. H. and E. M. McCray, Jr. GAS-CHROMATOGRAPHIC ANALYSIS OF RESIDUES OF PIRIMIPHOS-METHYL IN WATER, FISH, AND SNAILS. *Bull. Environ. Contam. Toxicol.* 28(3):334-340. Mar. 1982. SFA 27(2)
[Cent. Infectious Dis., Cent. Dis. Control, Publ. Health Serv., U.S. Dep. Health Human Serv., Atlanta, GA 30333]

RESEARCH AND MANAGEMENT-GENERAL

82-001151 Armantrout, N. B. BORAX LAKE CHUB: REVIEW OF RECENT EVENTS. *Proc. Desert Fishes Counc.* 12:69-70. 1980(1981). Abstract only. SFA 27(2)
[Bur. Land Manage., Portland, OR]

82-001152 Armantrout, N. B. and M. Crouse. WHITEHORSE CUTTHROAT TROUT. *Proc. Desert Fishes Counc.* 12:25-28. 1980(1981). SFA 27(2)
[Bur. Land Manage., Portland, OR] The Whitehorse trout is an undescribed subspecies of cutthroat trout (*Salmo clarki* Richardson) related to the Snake River cutthroat, native to the Whitehorse Basin of SE Oregon. Limited access has helped preserve the species from extinction through hybridization. The Bureau of Land Management, with close cooperation of the Oregon Department of Fish and Wildlife and the Whitehorse Ranch, is implementing a habitat management plan to protect the habitat of the trout. The trout has been successfully introduced into the adjoining Alvord Basin.

82-001153 Aron, W. FISHERY SCIENCE, UNCERTAINTY AND RESPONSIBILITY. *Fisheries (Bull. Am. Fish. Soc.)* 7(1):6-8. Jan.-Feb. 1982. SFA 27(2)
[NMFS, Northwest and Alaska Fish. Cent., Seattle, WA]

82-001154 Berst, A. H. and R. C. Simon. INTRODUCTION TO THE PROCEEDINGS OF THE 1980 STOCK CONCEPT INTERNATIONAL SYMPOSIUM (STOCS). *Can. J. Fish. Aquatic Sci.* 38(12):1457-1458. Dec. 1981. SFA 27(2)
[30 Fashion Roseway, Suite 203E, Willowdale, ON M2N 6B4, Canada]

82-001155 Booke, H. E. THE CONUNDRUM OF THE STOCK CONCEPT--ARE NATURE AND NURTURE DIFINABLE IN FISHERY SCIENCE? *Can. J. Fish. Aquatic Sci.* 38(12):1479-1480. Dec. 1981. In English with French summ. SFA 27(2)
[Mass. Coop. Fish. Res. Unit, Dep. For. Wildl. Manage., Univ. Mass., Amherst 01003]

82-001156 Erdheim, E. THE WAKE OF THE SNAIL DARTER: INSURING THE EFFECTIVENESS OF SECTION 7 OF THE ENDANGERED SPECIES ACT. *Ecol. Law Q.* 9(4):629-682. 1981. SFA 27(2)
[NOAA, Washington, DC]

82-001157 Gaudet, J.-L., (ed.) REPORT OF THE TECHNICAL CONSULTATION ON THE ALLOCATION OF FISHERY RESOURCES. *EIFAC Tech. Pap.* No. 38. vii + 45p. 1981. SFA 27(2)
[FAO of the UN, Rome, Italy]

82-001158 Johnson, J. E. THE RESURRECTION OF SAN BERNARDINO. *Proc. Desert Fishes Counc.* 12:92-93. 1980(1981). In English and Spanish. Abstract only. SFA 27(2)
[U.S. FWS, Albuquerque, NM]

RESEARCH AND MANAGEMENT-GENERAL (CONTINUED)

82-001159 Loftus, K. H. WHERE ARE WE NOW? *Can. J. Fish. Aquatic Sci.* 38(12):1464-1465. Dec. 1981. SFA 27(2)
[Ontario Minist. Nat. Resour., Toronto, ON, Canada]

82-001160 MacLean, J. A. and D. O. Evans. THE STOCK CONCEPT, DISCRETENESS OF FISH STOCKS, AND FISHERIES MANAGEMENT. *Can. J. Fish. Aquatic Sci.* 38(12):1889-1898. Dec. 1981. In English with French summ. SFA 27(2)
[Ontario Minist. Nat. Resour., Res. Sect., Fish. Br., Maple, ON L0J 1E0 Canada]

82-001161 Maitland, P. S.; H. A. Regier; G. Power and N. A. Nilsson. A WILD SALMON, TROUT, AND CHAR WATCH: AN INTERNATIONAL STRATEGY FOR SALMONID CONSERVATION. *Can. J. Fish. Aquatic Sci.* 38(12):1882-1888. Dec. 1981. In English with French summ. SFA 27(2)
[Inst. Terrestrial Ecol., 78 Craighall Rd., Edinburgh, Scotland]

82-001162 Meefe, G. K. CURRENT STATUS OF ENDANGERED TOPMINNOWS (POECILIIDAE: *POECILIOPSIS*). *Proc. Desert Fishes Counc.* 12:107-108. 1980(1981). In English and Spanish. Abstract only. SFA 27(2)
[Dep. Zool., Ariz. State Univ., Tempe 85281]

82-001163 Moyle, P. B. and J. J. Cech, Jr. FISHES: AN INTRODUCTION TO ICHTHYOLOGY. xiv + 593p. 1982. Available @ $29.95 from Prentice-Hall, Inc., Englewood Cliffs, NJ 07632. SFA 27(2)
This book is designed to serve as a text in classes in fish biology.--RS

82-001164 Rigler, F. H. THE RELATION BETWEEN FISHERIES MANAGEMENT AND LIMNOLOGY. *Trans. Am. Fish. Soc.* 111(2):121-132. Mar. 1982. SFA 27(2)
[Dep. Biol., McGill Univ., Montreal, PQ H3A 1B1, Canada]

82-001165 Rinne, J. N. RESEARCH ON TWO NATIVE SOUTHWESTERN TROUTS AND ITS MANAGEMENT IMPLICATIONS. *Proc. Desert Fishes Counc.* 12:112-118. 1980(1981). In English and Spanish. Abstract only. SFA 27(2)
[Rocky Mountain For. Range Exp. Stn., Tempe, AZ 85281]

82-001166 Senanayake, F. R. and P. B. Moyle. CONSERVATION OF FRESHWATER FISHES OF SRI LANKA. *Biol. Conserv.* 22(3):181-195. Mar. 1982. SFA 27(2)
[41 Gregorys Rd., Colombo 7, Sri Lanka] Sri Lanka supports a diverse fauna of freshwater fishes, 24% of which are endemic. A survey of the island's streams indicated that a number of the endemic fishes are threatened with extinction and others are depleted due to the interaction of deforestation, urbanization, gem mining, pesticides, exploitation, water diversions, and introductions of exotic species. It is clear that these declines should be halted for ethical, economic, and ecological reasons. Methods proposed to reverse the declines include captive breeding, better watershed management, translocation, and regulation of fisheries, especially that for aquarium fishes. The depauperate Second Peneplain is proposed as a site for translocation of endangered species.

82-001167 Sousa, R. J. A NATIONAL OVERVIEW OF FISHERY RESEARCH FUNDED BY THE DINGELL-JOHNSON PROGRAM. *Fisheries (Bull. Am. Fish. Soc.)* 7(1):3-6. Jan.-Feb. 1982. SFA 27(2)
[U.S. Fish Wildl. Serv., Washington, DC 20240]

RESEARCH AND MANAGEMENT-GENERAL (CONTINUED)

82-001168 Spangler, G. R.; A. H. Berst and J. F. Koonce. PERSPECTIVES AND POLICY RECOMMENDATIONS ON THE RELEVANCE OF THE STOCK CONCEPT TO FISHERY MANAGEMENT. *Can. J. Fish Aquatic Sci.* 38(12):1908-1914. Dec. 1981. In English with French summ. SFA 27(2)
[Univ. Minn., St. Paul 55108]

82-001169 Utter, F. M. BIOLOGICAL CRITERIA FOR DEFINITION OF SPECIES AND DISTINCT INTRASPECIFIC POPULATIONS OF ANADROMOUS SALMONIDS UNDER THE U.S. ENDANGERED SPECIES ACT OF 1973. *Can. J. Fish. Aquatic Sci.* 38(12):1626-1635. Dec. 1981. In English with French summ. SFA 27(2)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

HABITAT ALTERATIONS

82-001170 Becker, C. D.; D. H. Fickeisen and J. C. Montgomery. ASSESSMENT OF IMPACTS FROM WATER LEVEL FLUCTUATIONS ON FISH IN THE HANFORD REACH, COLUMBIA RIVER. *Battelle Pac. Northwest Lab.* PNL-3813. 53p. May 1981. SFA 27(2)
[Battelle Pac. Northwest Lab., Richland, WA]

82-001171 Blackie, J. R.; E. D. Ford; J. E. M. Horne; D. J. J. Kinsmore; F. T. Last and P. Moorhouse. ENVIRONMENTAL EFFECTS OF DEFORESTATION: AN ANNOTATED BIBLIOGRAPHY. *Freshwater Biol. Assoc. Occas. Publ.* No. 10. 173p. 1980. SFA 27(2)
[Inst. Hydrol., Freshwater Biol. Lab., Ambleside, England]

82-001172 Clugston, J. P. and E. D. Prince. ENVIRONMENTAL IMPACTS OF PUMPED STORAGE HYDROELECTRIC DEVELOPMENT. *Symp. Proc. Unified River Management (Am. Water Resour. Assoc.)* p. 580-587. 1980. SFA 27(2)
[U.S. FWS, Southeast Reservoir Invest., 206 Highway 123 By-Pass, Clemson, SC 29631] Pumped storage hydroelectric development is an important method of electrical power production in the United States. Pumped storage is unique because it provides a means of converting excess electrical energy during periods of low demand to a storable form which can be reconverted to electricity during times of peak needs. There are now about 29 developed pumped storage plants in the United States, and over 1,000 potential sites have been identified. Environmental concerns of pumped storage development were discussed by about 70 biologists and engineers from throughout the United States at a recent workshop in Clemson, South Carolina. This paper synthesizes information from the workshop and selected recent publications in order to help those involved in multipurpose river basin planning and management gain a better understanding of environmental alterations caused by pumped storage operations. This information will also be helpful in developing ways to meet environmental requirements set forth by regulatory agencies.

82-001173 Courtois, L. A. RESPONSE OF THE MOHAVE CHUB, *GILA BICOLOR MOHAVENSIS*, TO DEWATERING OF AN ARTIFICAL IMPOUNDMENT. *Calif. Fish Game* 68(1):61-62. Jan. 1982. SFA 27(2)
[Calif. Dep. Fish Game, 1701 Nimbus Rd., Rancho Cordova 95670]

HABITAT ALTERATIONS (CONTINUED)

82-001174 Davies, R. M. PROPOSED METHODOLOGY FOR DETERMINING ROAD CONSTRUCTION AND POPULATION CENTER GROWTH IMPACTS AND THEIR SIGNIFICANCE ON DESERT FISHES AND AQUATIC INVERTEBRATES. *Proc. Desert Fishes Counc.* 12:29-40. 1980(1981). SFA 27(2)
[HDR Sci., 804 Anacapa St., Santa Barbara, CA 93101]

82-001175 Fast, A. W.; L. H. Bottroff and R. L. Miller. LARGEMOUTH BASS, *MICROPTERUS SALMOIDES*, AND BLUEGILL, *LEPOMIS MACROCHIRUS*, GROWTH RATES ASSOCIATED WITH ARTIFICIAL DESTRATIFICATION AND THREADIN SHAD, *DOROSOMA PETENENSE*, INTRODUCTIONS AT EL CAPITAN RESERVOIR, CALIFORNIA. *Calif. Fish Game* 68(1):4-20. Jan. 1982. SFA 27(2)
[Hawaii Inst. Mar. Biol., Univ. Hawaii, P.O. Box 1346, Kaneohe 96744] Growth rates of age 1 largemouth bass and bluegill decreased following introduction of threadfin shad in 1958. Decreased growth is attributed to competition for food between age 1 gamefish and threadfin shad. Growth rates of older largemouth bass and bluegill generally increased following the threadfin shad introduction, due to increased forage provided by threadfin shad. Growth rates of age 1 largemouth bass and bluegill increased from 1964 through 1966 during artificial destratification, possibly due to decreased competition with threadfin shad. Growth rate trends of older largemouth bass and bluegill during destratification were less distinct, but an initial increase during the first year or two of destratification was followed by declining growth rates for largemouth bass.

82-001176 Minckley, W. L. CHANGES IN THE CUATRO CIENEGAS BASIN, COAHUILA, MEXICO, 1958-79. *Proc. Desert Fishes Counc.* 12:109. 1980(1981). In English and Spanish. Abstract only. SFA 27(2)
[Dep. Zool., Ariz. State Univ., Tempe 85281]

82-001177 Platts, W. S. SHEEP AND CATTLE GRAZING STRATEGIES ON RIPARIAN-STREAM ENVIRONMENTS. *In Proc. Wildlife-Livestock Relationships Symp., Univ. Idaho.* 1981. Available from USDA, Intermountain For. Range Exp. Stn., 507 25th St., Ogden, UT 84401. SFA 27(2)
Research studies involving the effects of cattle and sheep grazing strategies on stream riparian habitat are discussed. Initial results indicate that herded sheep grazing may have little effect on streams and the riparian environment. The effects of cattle grazing first appear on the streambanks and riparian vegetation. Habitat alteration occurs at utilization rates of 65% or more, and alteration is insignificant when utilization is less than 25 percent. Continued research is needed to identify grazing strategies compatible with riparian environments, and to develop new grazing strategies.

82-001178 Smith, B. W.; G. R. Hooper and C. S. Lawson. OBSERVATION OF FISH ATTRACTION TO IMPROVED ARTIFICIAL MIDWATER STRUCTURES IN FRESHWATER. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:404-409. 1980[1981]. SFA 27(2)
[Ala. Game Fish Div., Fish. Sect., 64 N. Union St., Montgomery 36130] Artificial midwater structures constructed primarily with fiberglass panels and automobile tires were placed in an oligotrophic storage reservoir to determine the extent of fish association with these structures. SCUBA observations were used to evaluate the effectiveness of the structures. Comparisons were made between these and previous structures used by Reeves et al. (1977). Six species of game fish were attracted; however, Alabama spotted bass (*Micropterus punctulatus henshalli*) and bluegill sunfish (*Lepomis macrochirus*) were the predominant species. Concentrations of harvestable spotted bass were noted throughout most of the summer months.

HABITAT ALTERATIONS (CONTINUED)

82-001179 Wright, D. G. A DISCUSSION PAPER ON THE EFFECTS OF EXPLOSIVES ON FISH AND MARINE MAMMALS IN THE WATERS OF THE NORTHWEST TERRITORIES. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1052. v + 16p. Feb. 1982. SFA 27(2)
[Dep. Fish. Oceans, Winnipeg, MB R3T 2N6, Canada]

HARVEST, CREEL CENSUS, ETC.

82-001180 Anderson, L. G. OPTIMAL UTILIZATION OF FISHERIES WITH INCREASING COSTS OF EFFORT. *Can. J. Fish. Aquatic Sci.* 39(1):211-214. Jan. 1982. In English with French summ. SFA 27(2)
[Coll. Mar. Stud., Univ. Del., Newark 19711]

82-001181 Freeze, M. and S. Henderson. ECONOMIC EVALUATION OF THE WILD COMMERCIAL FISHERY IN ARKANSAS--1JULY 1978 TO 30 JUNE 1979. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:372-378. 1980[1981]. SFA 27(2)
[Ark. Game Fish Comm., Little Rock 72205]

82-001182 McHugh, J. L. MARINE FISHERIES OF DELAWARE. *NOAA Fish. Bull.* 79(4):575-599. Oct. 1981. SFA 27(2)
[Mar. Sci. Res. Cent., State Univ. N.Y., Stoney Brook 11794]

82-001183 Smith, J. E. CATCH AND EFFORT STATISTICS OF THE CANADIAN GROUNDFISH FISHERY ON THE PACIFIC COAST IN 1980. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1032. iv + 90p. Nov. 1981. In English with French summ. SFA 27(2)
[Dep. Fish. Oceans, Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

82-001184 Thompson, P. C. THE ECONOMIC PERFORMANCE OF THE COMMERCIAL SKIFF FISHERY IN WESTERN CANADA. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1037. v + 21p. Dec. 1981. In English with French summ. SFA 27(2)
[Dep. Fish. Oceans, Winnipeg, MB R3T 2N6, Canada]

82-001185 Ward, W. D.; L. J. Hoines and G. D. Nye, (eds.). 1979-80 FISHERIES STATISTICAL REPORT. *Wash. Dep. Fish. Fish. Stat. Rep.* ii + 70p. 1981. SFA 27(2)

82-001186 Weithman, A. S. and M. A. Haas. SOCIOECONOMIC VALUE OF THE TROUT FISHERY IN LAKE TANEYCOMO, MISSOURI. *Trans. Am. Fish. Soc.* 111(2):223-230. Mar. 1982. SFA 27(2)
[Fish Wildl. Res. Cent., Mo. Dep. Conserv., Columbia 65201]

FISH CONTROL AND REMOVAL

82-001187 Filipek, S. SURVEY AND EVALUATION OF ARKANSAS' CHEMICAL REHABILITATION OF LAKES. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:181-192. 1980[1981]. SFA 27(2)
[Ark. Game Fish Comm., Little Rock 72205] Arkansas has carried out an extensive program of chemical rehabilitation of lakes and reservoirs since 1953. In the 27-year period since the first renovation, over 220 major lakes

FISH CONTROL AND REMOVAL (CONTINUED)

82-001187 CONTINUED and impoundments have been treated with 94,445 kg of 5 percent equivalent rotenone powder and 37,123 liters of 5 percent liquid rotenone. A total of 18,839 ha have been treated on these lakes. Chemical rehabilitation may be required every 3 to 5 years on some lakes in Arkansas. Gizzard shad (*Dorosoma cepedianum*) is usually the problem species but often sunfish, particularly *Lepomis* spp., and other species of fish overpopulate, stunt and requrie thinning. Thirteen chemical renovations on 7 state lakes were evaluated. In 11 cases, desired goals were achieved. Generally, large gizzard shad populations can be significantly decreased by renovation with the black bass population often receiving the greatest benefit. The results of this study overwhelmingly support the Arkansas Game and Fish Commission's policy of active fishery management utilizing chemical reclamation as a major tool.

MARKING AND TAGGING

82-001188 Behrens Yamada, S. and T. J. Mulligan. STRONTIUM MARKING OF HATCHERY REARED COHO SALMON, *ONCORHYNCHUS KISUTCH* WALBAUM, IDENTIFICATION OF ADULTS. *J. Fish Biol.* 20(1):5-9. Jan. 1982. SFA 27(2)
[Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada] Hatchery-raised coho salmon were marked with stable strontium prior to their release to sea. Returning marked spawners were correctly identified after 18 months at sea by measuring the Strontium (Sr) concentration of the central region of their scales and vertebrae.

82-001189 Hay, D. E. RETENTION OF TAGS AND SURVIVAL OF TAGGED PACIFIC HERRING HELD IN CAPTIVITY. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1050. v + 15p. Dec. 1981. In English with French summ. SFA 27(2)
[Dep. Fish. Oceans, Resour. Serv. Br., Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada] Herring were tagged and maintained in captivity for 18 months to determine the effects of tagging on survival and estimate the rate of retention of tags. Initial mortality within 2 months of tagging was low, varying between 2% and 18% among 3 separate groups. Lowest initial mortality occurred among one group held in captivity the longest (14 months) prior to tagging. After 6 months there was no evidence of reduced viability of tagged fish compared to untagged fish held in the same enclosures; comparison of length-weight regressions and gonosomatic indices between tagged and untagged fish showed no significant differences. Mortality continued gradually throughout the duration of the test but increased suddenly after approximately 16 months during an outbreak of disease. Several months after the start of the test loose tags lost from live herring were found on tank bottoms. The frequency of loose or unrecovered tags (loose tage that were lost in drains) was estimated at 9% after 6 months and 22-26% after 18 months. Mortality due solely to tagging is probably not substantial within the first year after tagging, however, the rate of tag loss from fish is high. Special attention to this problem may be warrented in the design of future tagging and tag recovery programs.

82-001190 MacLennan, D. N. THE THEORY OF SOLID SPHERES AS SONAR CALIBRATION TARGETS. *Scott. Fish. Res. Rep.* No. 22. 17p. 1981. SFA 27(2)
[Mar. Lab., Aberbeen, Scotland]

82-001191 Persat, H. PHOTOGRAPHIC IDENTIFICATION OF INDIVIDUAL GRAYLING, *THYMALLUS THYMALLUS*, BASED ON THE DISPOSITION OF BLACK DOTS AND SCALES. *Freshwater Biol.* 12(1):97-101. Feb. 1982. SFA 27(2)
[Dep. Biol. Anim. Ecol., Univ. Lyon I, F-69622 Villeurbanne Cedex, France] The flanks of grayling are generally studded with black dots which vary in number. The number and position of these dots are well-defined for each

MARKING AND TAGGING (CONTINUED)

82-001191 CONTINUED individual and make it possible to identify each fish. In some cases, as when there are very few dots or none at all, it is necessary to make use of other features such as the general dispositon of the scales. The best method for recording these characters is by photographing each fish. When recaptured, a fish can be recognized by comparing photographs. The number and position of dots on their lines can be sorted by a computer. Ultimate confirmation is given by comparing the most likely photographs once they have been selected by computer.

82-001192 Ross, M. J. and C. F. Kleiner. SHIELDED-NEEDLE TECHNIQUE FOR SURGICALLY IMPLANTING RADIO-FREQUENCY TRANSMITTERS IN FISH. *Prog. Fish-Cult.* 44(1):41-43. Jan. 1982. SFA 27(2)
[Univ. Minn., Dep. Ecol. Behav. Biol., Minneapolis 55455]

82-001193 Wilson, T. C. AN UNDERWATER FISH TAGGING METHOD. *Calif. Fish Game* 68(1):47-50. Jan. 1982. SFA 27(2)
[Pac. Gas Elec. Co., Dep. Eng. Res., 3400 Crow Canyon Rd., San Ramon, CA 94583]

STOCKING AND INTRODUCTIONS

82-001194 Fraser, J. M. COMPARATIVE SURVIVAL AND GROWTH OF PLANTED WILD, HYBRID, AND DOMESTIC STRAINS OF BROOK TROUT (*SALVELINUS FONTINALIS*) IN ONTARIO LAKES. *Can. J. Fish. Aquatic Sci.* 38(12):1672-1684. Dec. 1981. In English with French summ. SFA 27(2)
[Ontario Minist. Nat. Resour., Box 50, Maple, ON L0J 1E0, Canada]

82-001195 Helfrich, L. A. and W. T. Kendall. MOVEMENTS OF HATCHERY-REARED RAINBOW, BROOK, AND BROWN TROUT STOCKED IN A VIRGINIA MOUNTAIN STREAM. *Prog. Fish-Cult.* 44(1):3-7. Jan. 1981. SFA 27(2)
[Dep. Fish. Wildl. Sci., VPI&SU, Blacksburg, VA 24061]

82-001196 Hendrickson, D. NOTES ON THE DISTRIBUTION OF INTRODUCED FISHES IN PACIFIC DRAINAGES OF NORTHWESTERN MÉXICO. *Proc. Desert Fishes Counc.* 12:89. 1980(1981). In English and Spanish. Abstract only. SFA 27(2)
[Dep. Zool., Ariz. State Univ., Tempe 85281]

82-001197 Kendall, W. T. and L. A. Helfrich. DISPERSION PATTERNS OF HATCHERY-REARED RAINBOW TROUT STOCKED IN A VIRGINIA MOUNTAIN STREAM. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:318-329. 1980[1981]. SFA 27(2)
[Dep. Fish. Wildl. Sci., VPI&SU, Blacksburg, VA 24061] Dispersion patterns of 578 tagged rainbow trout stocked into pool and riffle habitats of Big Stony Creek, Giles County, Virginia, were determined for voluntary tag returns and a creel census of fishermen during the 1979-80 trout fishing season. Twenty-two percent of the trout remained within the original 30m stocking location; 45 percent of the trout moved downstream while 33 percent moved upstream. The median dispersion distance and direction for all trout that moved beyond the initial release sites was 30m downstream. The majority (75%) of the marked fish were caught within 400m of the stocking location. There was no significant difference ($P>0.136$) between the median distance moved of trout stocked into pools and those stocked into riffles. Three major

STOCKING AND INTRODUCTIONS (CONTINUED)

82-001197 CONTINUED physical factors (residence time, water temperatures, and stream flow rates) were found to strongly influence stocked trout dispersion. The distance trout moved was directly correlated ($R=0.50$, $p<0.001$) with the amount of time in the stream. During stream conditions of low water temperatures and high flow rates, trout dispersion increased. Movement of spring stocked rainbow trout was primarily downstream, while movement of fall stocked trout was upstream. Summer stocked rainbow trout showed little movement.

82-001198 Krueger, C. C.; A. J. Gharrett; T. R. Dehring and F. W. Allendorf. GENETIC ASPECTS OF FISHERIES REHABILITATION PROGRAMS. *Can. J. Fish. Aquatic Sci.* 38(12):1877-1881. Dec. 1981. In English with French summ. SFA 27(2)
[Wis. Dep. Nat. Resour., 101 South Webster St., GEF II, Box 7921, Madison 53707]

82-001199 MacLean, J. A.; D. O. Evans; N. V. Martin and R. L. DesJardine. SURVIVAL, GROWTH, SPAWNING DISTRIBUTION, AND MOVEMENTS OF INTRODUCED AND NATIVE LAKE TROUT (*SALVELINUS NAMAYCUSH*) IN TWO INLAND ONTARIO LAKES. *Can. J. Fish. Aquatic Sci.* 38(12):1685-1700. Dec. 1981. In English with French summ. SFA 27(2)
[Ontario Minist. Nat. Resour., Box 50, Maple, ON L0J 1E0, Canada]

82-001200 Moore, D. E. ESTABLISHING AND MAINTAINING THE TROUT FISHERY AT RUTLAND WATER. *Hydrobiologia* 88(1-2):179-189. 26 Mar. 1982. SFA 27(2)
[Anglian Water Authority, North St., Oundle, Peterborough, England]

82-001201 Nielsen, L. A.; W. T. Kendall and L. A. Helfrich. COMPARISON OF ANGLER USE AND CHARACTERISTICS AT THREE CATCHABLE TROUT FISHERIES IN VIRGINIA. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:330-340. 1980[1981]. SFA 27(2)
[Dep. Fish. Wildl. Sci., VPI&SU, Blacksburg, VA 24061] Creel census data for 3 catchable trout fisheries in Virginia revealed that desirable attributes of the fisheries increased from a lightly-stocked stream to a lightly-stocked lake to a heavily-stocked stream. Total effort, participation by non-local anglers, eveness of seasonal use, catch rate, and return rate all were higher for the heavily-stocked stream. For the trout lake, total effort and participation by non-local anglers were similar to the heavily-stocked stream, but catch per effort, return rates of stocked fish, and seasonal distribution of effort were similar to the lightly-stocked stream. Most anglers at the lake fished from shore so that a large portion of the potential fishing area was not utilized. Management of catchable trout fisheries may provide higher fishing value if streams are managed so that stocking density, stocking frequency, accessibility of angling, publicity, and opportunities for associated outdoor recreation are maximized.

82-001202 Reisenbichler, R. R.; J. D. McIntyre and R. J. Hallock. RELATION BETWEEN SIZE OF CHINOOK SALMON, *ONCORHYNCHUS TSHAWYTSCHA*, RELEASED AT HATCHERIES AND RETURNS TO HATCHERIES AND OCEAN FISHERIES. *Calif. Fish Game* 68(1):57-59. Jan. 1982. SFA 27(2)
[U.S. FWS, Bldg. 204, Naval Support Activity, Seattle, WA 98115]

82-001203 Webster, D. W. and W. A. Flick. PERFORMANCE OF INDIGENOUS, EXOTIC, AND HYBRID STRAINS OF BROOK TROUT (*SALVELINUS FONTINALIS*) IN WATERS OF THE ADIRONDACK MOUNTAINS, NEW YORK. *Can. J. Fish. Aquatic Sci.* 38(12):1701-1707. Dec. 1981. In English with French summ. SFA 27(2)
[Dep. Nat. Resour., Cornell Univ., Ithaca, NY 14853]

FISHING GEAR AND TECHNIQUES

82-001204 Ferro, R. S. T. CHOOSING THE SIZE OF SUBERKRUB TRAWL BOARD TO SUIT A PELAGIC-TYPE FOUR-PANEL TRAWL. *Scott. Fish. Inf. Pam.* No. 6. 5p. 1981. SFA 27(2)
[Dep. Agric. Fish., Mar. Lab., Aberdeen, Scotland]

82-001205 Ferro, R. S. T. THE CALCULATION OF THE TWINE AREA OF A TRAWL NET. *Scott. Fish. Inf. Pam.* No. 5. 6p. 1981. SFA 27(2)
[Dep. Agric. Fish., Mar. Lab., Aberdeen, Scotland]

82-001206 Grimes, C. B.; K. W. Able and S. C. Turner. DIRECT OBSERVATION FROM A SUBMERSIBLE VESSEL OF COMMERCIAL LONGLINES FOR TILEFISH. *Trans. Am. Fish. Soc.* 111(1):94-98. Jan. 1982. SFA 27(2)
[Dep. Horticult. For., Rutgers Univ., New Brunswick, NJ 08903]

82-001207 Guillory, V.; J. E. Roussel and C. Miller. APPRAISAL OF OTTER TRAWL TOW LENGTHS AND REPLICATE SAMPLING. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:158-166. 1980[1981]. SFA 27(2)
[La. Dep. Wildl. Fish., Mar. Res. Lab., Grand Isle 70358] This study was conducted to determine the effects of otter trawl tow length on variability and catch rates, and to assess replicate sampling. Longer tows caught more individuals/minute, individuals/tow, and species/tow than the shorter tows. The total number of species caught per hour of sampling, however, were esentially equal for all tow lengths. No difference in precision between tow lengths were detected. The number of replicates needed to detect changes within desirable statistical limits were logistically impractical. We recommend that otter trawls be used strictly for qualitative purposes and conclude that a small number of replicated 10-minute tows would adequately described basic community structure.

82-001208 Honda, K.; M. Suzuki and K. Matuda. [STRENGTH AGAINST REPEATED IMPACT LOAD ON NETTING TWINES.] *Bull. Jpn. Soc. Sci. Fish.* 47(11):1431-1435. Nov. 1981. In Japanese with English summ. SFA 27(2)
[Tokyo Univ. Fish., 5-7, Konan-4, Minato, Tokyo 108, Japan]

82-001209 International Council for the Exploration of the Sea. GUIDE TO EXPERIMENTAL PROCEDURE IN FISHING GEAR RESEARCH AND DEVELOPMENT. *Int. Counc. Explor. Sea Coop. Res. Rep.* No. 109. 38p. Aug. 1981. SFA 27(2)
[Palægade 2-4, 1261 Copenhagen K, Denmark]

82-001210 Miller, C. and V. Guillory. A COMPARISON OF MARSH FISH COMMUNITIES USING THE WEGENER RING. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:223-233. 1980[1981]. SFA 27(2)
[La. Dep. Wildl. Fish., Mar. Res. Lab., Grand Isle 70358] Three marsh types (saline, brackish, and freshwater) in the Barataria Basin were sampled with the Wegener Ring. Forty-four species were collected, representing 21 families. Overall species composition and within species abundance varied from saline to freshwater environments. Shannon-Weaver diversity and evenness diversity show a decreasing gradient from saline to freshwater marsh. Number of individuals collected had an opposite gradient. The order of sequence from highest to lowest for biomass was fresh, saline, and then brackkish. The saline marsh had the highest species richness value, while freshwater marsh had a slightly higher value than the brackish marsh.

FISHING GEAR AND TECHNIQUES (CONTINUED)

82-001211 Miura, T. [MULTIPLE CONSTRUCTION TRAP MODEL BEING AS AN EXAMPLE OF SET NETS AND OTHERS.] *Bull. Jpn. Soc. Sci. Fish.* 47(11):1401-1409. Nov. 1981. In Japanese with English summ. SFA 27(2)
[Fac. Fish., Hokkaido Univ., Hakodate 041, Japan]

82-001212 Schramm, H. L., Jr. and C. H. Pennington. DIEL FLUCTUATIONS OF LARVAL FISH IN THE LOWER MISSISSIPPI RIVER. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:360-371. 1980[1981]. SFA 27(2)
[Sch. For. Resour. Conserv., Univ. Fla., Gainesville 32611] Larval fish were collected in the Lower Mississippi River at Sunnyside Revetment on 27-28 June 1978 to investigate diel fluctuations in diversity and abundance and to determine whether samples collected for 1-2 hours and from opposite sides of the boat can be considered replicate samples for a time period. Number of taxa and density differed significantly ($P<0.01$) between time periods of the diel cycle. Number of taxa and density were greatest at dusk. Twelve taxa were collected only in dusk, night, and dawn samples. *Aplodinotus grunniens*, *Carpiodes* spp. and clupeids accounted for 95 percent of the larvae collected. *A. grunniens* and *Carpiodes* spp. were more abundant in dusk and night samples. Clupeids were more abundant diurnally. Variance component analyses indicated that samples collected for 1-2 hours during each time period can be considered replicate samples for diversity and abundance estimates for that time period and samples collected from opposite sides of the boat can be considered replicate samples for divesity but not density estimates for each time period.

82-001213 Shimamura, T. and H. Soeda. [ON THE CATCH BY DEEP LAYER TUNA LONG LINE FISHING.] *Bull. Jpn. Soc. Sci. Fish.* 47(12):1559-1565. Dec. 1981. In Japanese with English summ. SFA 27(2)
[Coll. Agric. Vet. Med., Nihon Univ., 34-1, Shimouma, Setagaya, Tokyo 154, Japan]

FERTILIZATION OF SOIL AND WATER

82-001214 Hansell, D. A. and C. E. Boyd. USES OF HYDRATED LIME IN FISH PONDS. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:49-58. 1980[1981]. SFA 27(2)
[Dep. Fish. Allied Aquacult., Auburn Univ., Auburn, AL 36849] Hydrated lime is not as suitable as agricultural limestone for increasing pH and total alkalinity in soft water ponds. However, small amounts of hydrated lime may be applied during dry summer months to increase alkalinity for several weeks in ponds that have such high water exchange rates during wetter months that conventional applications of agricultural limestone are ineffective. Hydrated lime is an effective sterilant for damp pond bottoms. It will also remove carbon dioxide from water. Hydrated lime is not an oxidizing agent, so it will not destroy organic matter in mud or water. The biochemical oxygen demand (BOD) of water may be reduced by large applications of hydrated lime because the lime increases pH to levels toxic to microorganisms. The concentraton of hydrated lime necessary to reduce BOD will retard photosynthesis and will harm fish. Although hydrated lime can be used to raise pH and kill fish, its potential as a fish eradicant needs further study. Hydrated lime is not as effective as alum in coagulating clay turbidity. There is no evidence that hydrated lime will reduce problems with off-flavor in fish.

82-001215 McGeachin, R. B. and R. R. Stickney. MANURING RATES FOR PRODUCTION OF BLUE TILAPIA IN SIMULATED SEWAGE LAGOONS RECEIVING LAYING HEN WASTE. *Prog. Fish-Cult.* 44(1):25-28. Jan. 1982. SFA 27(2)
[Dep. Wildl. Fish. Sci., Tex. A&M Univ., College Station 77842]

FERTILIZATION OF SOIL AND WATER (CONTINUED)

82-001216 Melack, J. M.; P. Kilham and T. R. Fisher. RESPONSES OF PHYTOPLANKTON TO EXPERIMENTAL FERTILIZATION WITH AMMONIUM AND PHOSPHATE IN AN AFRICAN SODA LAKE. *Oecologia (Berl.)* 52(3):321-326. Mar. 1982. SFA 27(2)
[Dep. Biol. Sci., Univ. Calif., Santa Barbara 93106]

FISHWAYS, FISH PASSAGE THROUGH DAMS, ETC.

82-001217 Jensen, A. L. and T. A. Hamilton. APPLICATION OF A CONVENTIONAL FISHERY MODEL FOR ASSESSMENT OF ENTRAINMENT AND IMPINGEMENT IMPACT. *Environ. Biol. Fishes* 7(2):181-185. 15 Mar. 1982. SFA 27(2)
[Sch. Nat. Resour., Univ. Mich., Ann Arbor 48109] A conventional stock assessment model is applied to determine the impact of entrainment and impingement at the Monroe Power Plant on the yellow perch stock of the Western basin of Lake Erie. Parameters of the model are estimated using power plant data, biological data available in the literature, and commercial catch data. The model is applied to estimate the age structure and biomass of the perch stock and to estimate the impact of the power plant on abundance of the impingeable stock and abundance and biomass of the exploited stock. The level of impact was examined under a range of mortality conditions. Under the most extreme conditons examined of full pumping, high fishing mortality, and low natural mortality, the fishable biomass is reduced by 1.7%. This impact is not large, but there are several other power plants and many additional water intakes around the Western basin of Lake Erie.

82-001218 Jensen, A. L.; S. A. Spigarelli and M. M. Thommes. USE OF CONVENTIONAL FISHERY MODELS TO ASSESS ENTRAINMENT AND IMPINGEMENT OF THREE LAKE MICHIGAN FISH SPECIES. *Trans. Am. Fish. Soc.* 111(1):21-34. Jan. 1982. SFA 27(2)
[Sch. Nat. Resour., Univ. Mich., Ann Arbor 48109]

82-001219 Sano, N.; T. Mikami; Y. Akiba and G. Anma. [ON THE TRIAL PRODUCTION AND USE OF FISH COUNTING SYSTEM OF SALMON ENTERING THE MOHEJI RIVER.] *Bull. Fac. Fish. Hokkaido Univ.* 32(4):388-399. Nov. 1981. In Japanese with English summ. SFA 27(2)
[Lab. Instru. Eng. Fish., Fac. Fish., Hokkaido Univ., Hakodate, Japan]

82-001220 Ulanowicz, R. E.; J. M. Lindsay; W. C. Caplins and T. T. Polgar. SIMULATING THE LATERAL TRANSPORT OF ICHTHYOPLANKTON IN THE POTOMAC ESTUARY. *Estuaries* 5(1):57-67. Mar. 1982. SFA 27(2)
[Univ. Md., Cent. Environ. Estuarine Stud., Chesapeake Biol. Lab., Solomons, MD 20688] Previous simulations of potential ichthyoplankton entrainment by power generating stations of the Potomac estuary have not included the influence of lateral transport in distributing eggs and larvae over the nursery area. Therefore, two-dimensional, vertically-averaged hydrodynamic and kinematic models of passive organism transport were developed to represent advective and dispersive processes near the proposed Douglas Point Nuclear Generating Station. Although the more refined model did not substantially alter the estimate of ichthyoplankton entrainment, it did reveal that lateral inhomogeneities in hydrodynamics could engender severalfold differences in entrainment probabilities on opposite sides of the estuary. Models of higher resolution and greater biological detail did not project greater total entrainment by the Douglas Point plant, because the volume of nontidal flow past the site was large in comparison to the proposed rate of cooling water withdrawal.

MATHEMATICS, STATISTICAL METHODS, AND MODELING

82-001221 Briggs, H.; R. Townsend and J. Wilson. AN INPUT-OUTPUT ANALYSIS OF MAINE'S FISHERIES. *Mar. Fish. Rev.* 44(1):1-7. Jan. 1982. SFA 27(2)
[Dep. Econ., Univ. Me., Orono 04469]

82-001222 Gardner, P. N. USE OF CYCLE DUMMY VARIABLES AND RACE ESCAPEMENT IN THE FRASER RIVER SOCKEYE SALMON (*ONCORHYNCHUS NERKA*) RECRUITMENT FUNCTION. *Can. J. Fish. Aquatic Sci.* 39(2):264-269. Feb. 1982. In English with French summ. SFA 27(2)
[Dep. Econ., Univ. Prince Edward Island, 550 University Ave., Charlottetown, P.E.I. C1A 4P3, Canada]

82-001223 Giguère, L. A.; A. Delâge; L. M. Dill and J. Gerritsen. PREDICTING ENCOUNTER RATES FOR ZOOPLANKTON: A MODEL ASSUMING A CYLINDRICAL ENCOUNTER FIELD. *Can. J. Fish. Aquatic Sci.* 39(2):237-242. Feb. 1982. In English with French summ. SFA 27(2)
[Dep. Biol. Sci., Simon Fraser Univ., Burnaby, BC V5A 1S6, Canada]

82-001224 Kitabatake, Y. A DYNAMIC PREDATOR-PREY MODEL FOR FISHERY RESOURCES: A CASE OF LAKE KASUMIGAURA. *Environ. Plan. A* 14(2):225-235. Feb. 1982. SFA 27(2)
[Natl. Inst. Environ. Stud., Yatabe-machi, Tsukuba, Ibaraki 305, Japan] A dynamic model for fishery resources with predator-prey relationships is constructed based on observational data and research findings for Lake Kasumigaura, Japan. The analysis of the stationary state as well as the sensitivity analysis shows that the use of diesel-powered trawling, which enables the large-scale catch of prey species in comparison with the traditional method of sailing trawling, may lead to the extinction of predator as well as prey species once the trawling efficiency in the catch of prey species is improved beyond the present level, provided that fishermen behave so as to maximize their profits subject to the restriction of operation time.

82-001225 Muller, M.; J. W. M. Osse and J. H. G. Verhagen. A QUANTITATIVE HYDRODYNAMICAL MODEL OF SUCTION FEEDING IN FISH. *J. Theor. Biol.* 95(1):49-79. 7 Mar. 1982. SFA 27(2)
[Dep. Exp. Anim. Morphol. Cell Biol., Agric. Univ., Zodiac Marjkeweg 40, 6709 PG Wageningen, Netherlands]

82-001226 Reed, R. B. and W. D. Davies. ESTIMATING RATE OF EXPLOITATION FROM TAG RETURNS AND FISHING EFFORT. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:151-157. 1980[1981]. SFA 27(2)
[Dep. Fish. Allied Aquacult., Agric. Exp. Stn., Auburn Univ., Auburn, AL 36849] A method was developed for estimating rate of exploitation from the rate of decline in catch per unit effort of tagged fish. The method was used to estimate exploitation of largemouth bass (*Micropterus salmoides*) at a 75-ha Chambers County Public Fishing Lake, Alabama. Fishing effort directed towards largemouth bass was estimated from an access creel survey employing nonuniform probability sampling. The estimated 58 percent rate of exploitation agreed well with an independent estimate made using catch records and an estimate of the number of harvestable-size (>249mm total length) bass in the population.

MATHEMATICS, STATISTICAL METHODS, AND MODELING (CONTINUED)

82-001227 Sims, S. E. ALGORITHMS FOR SOLVING THE CATCH EQUATION FORWARD AND BACKWARD IN TIME. *Can. J. Fish. Aquatic Sci.* 39(1):197-202. Jan. 1982. In English with French summ. SFA 27(2)
[Dep. Math. Stat., La. Tech Univ., Ruston 71272]

LAKE MANAGEMENT AND RESEARCH

82-001228 Bagenal, T. B. EXPERIMENTAL MANIPULATIONS OF THE FISH POPULATIONS IN WINDERMERE. *Hydrobiologia* 86(1-2):201-205. 16 Jan. 1982. SFA 27(2)
[Freshwater Biol. Assoc., Windermere Lab., Ambleside, Cumbria, England] A large scale experiment has been carried out on the perch and pike populations of Windermere in the English Lake District for nearly 40 years, and the objectives have changed over this period. Initially the aim was to manage the trout population, but the work has produced data of interest in predator-prey relationships and pike management. Perch was first heavily fished and then monitored for size, and numbers by trapping. Large pike have been culled by gill netting. The effects of pike gill netting have been to increase the growth rate and decrease the average age in the population. These changes in the pike population structure, together with climatic variations, have modified the perch population. The perch did not recover from the heavy fishing for many years and the population numbers remained low due to pike predation supressing recruitment. It was not until a large cohort, mainly controlled by the weather, was produced that the population increased. Cannibalism by these perch later combined with the pike predation to suppress future cohorts. There have also been as yet unexplained changes in the perch mortality rates. The experiments have led to a greater understanding of the relationship between pike and perch populations, but the use of this knowledge for management depends on what the objectives are.

82-001229 Borgeson, D. P. CHANGING MANAGEMENT OF GREAT LAKES FISH STOCKS. *Can. J. Fish. Aquatic Sci.* 38(12):1466-1468. Dec. 1981. SFA 27(2)
[Fish. Div., Mich. Dep. Nat. Resour., Lansing 48909]

82-001230 Brown, E. H., Jr.; G. W. Eck; N. R. Foster; R. M. Horrall and C. E. Coberly. HISTORICAL EVIDENCE FOR DISCRETE STOCKS OF LAKE TROUT (*SALVELINUS NAMAYCUSH*) IN LAKE MICHIGAN. *Can. J. Fish. Aquatic Sci.* 38(12):1747-1758. Dec. 1981. In English with French summ. SFA 27(2)
[U.S. FWS, Great Lakes Fish. Lab., Ann Arbor, MI 48105]

82-001231 Fetterolf, C. M., Jr. FORWORD TO THE STOCK CONCEPT SYMPOSIUM. *Can. J. Fish. Aquatic Sci.* 38(12):iv-v. Dec. 1981. SFA 27(2)
[Great Lakes Fish. Comm., 1451 Green Rd., Ann Arbor, MI 48105]

82-001232 Goodier, J. L. NATIVE LAKE TROUT (*SALVELINUS NAMAYCUSH*) STOCKS IN THE CANADIAN WATERS OF LAKE SUPERIOR PRIOR TO 1955. *Can. J. Fish. Aquatic Sci.* 38(12):1724-1737. Dec. 1981. In English with French summ. SFA 27(2)
[Inst. Environ. Stud., Univ. Toronto, Toronto, ON M5S 1A4, Canada]

82-001233 Hickman, T. J. and R. Williams. DISCOVERY AND MANAGEMENT OF THE ORIGINAL PYRAMID LAKE CUTTHROAT TROUT. *Proc. Desert Fishes Counc.* 12:90-91. 1980(1981). In English and Spanish. SFA 27(2)

LAKE MANAGEMENT AND RESEARCH (CONTINUED)

82-001233 CONTINUED
[U.S. FWS, Fort Collins, CO] In 1977, a pure population of the original strain of Pyramid Lake cutthroat trout, *Salmo clarki henshawi* (a federally threatened species), was discovered by the senior author in a small unnamed stream on the Pilot Peak range, Utah-Nevada. The Pyramid Lake cutthroat trout was the largest trout native to Western North America. The original strain of Pyramid Lake cutthroat trout was presumed extinct after the 1940's. During the spring of 1980, 200 eggs were collected and transported from this unnamed stream to a federal fish hatchery, but no fish hatched successfully. Also during the spring of 1980, 18 trout were transplanted to a nearby creek, Bettridge Creek. Thus far the transplant is believed to have a been success. Future management plans involve developing a broodstock of this Pyramid Lake strain and establishing new populations within its native range. Developing a broodstock will be difficult because of the low numbers of trout in this population. It is hopeful that the introduced population in Bettridge Creek will provide additional fish to work with.

82-001234 Jones, J. R. and M. V. Hoyer. SPORTFISH HARVEST PREDICTED BY SUMMER CHLOROPHYLL-α CONCENTRATION IN MIDWESTERN LAKES AND RESERVOIRS. *Trans. Am. Fish. Soc.* 111(2):176-179. Mar. 1982. SFA 27(2)
[Sch. For. Fish. Wildl., Univ. Mo., Columbia 65211]

82-001235 Kautz, R. S. EFFECTS OF EUTHROPHICATION ON THE FISH COMMUNITIES OF FLORIDA LAKES. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:67-80. 1980[1981]. SFA 27(2)
[Off. Environ. Serv., Fla. Game Fresh Water Fish Comm., Tallahassee 32301] From an analysis of the trophic status and fish populations of 22 Florida lakes, total fish biomass is low in oligotrophic lakes, increases to a maximum in mesotrophic-eutrophic lakes, and fluctuates around the maximum value in hypereutrophic lakes. Total fish density likewise is low in oligotrophic lakes and increases to a maximum in mesotrophic-eutrophic lakes; but unlike biomass, fish density declines as lakes become hypereutrophic and gizzard shad becomes the dominant species of fish. Sport fishes reach maximum biomass and optimum densities in mesotrophic-eutrophic lakes with a total nitrogen concentration of 1.2mg/l and a chlorophyll *a* concentration of 11.0ug/l, but suffer adverse effects with further enrichment.

82-001236 Kutkuhn, J. H. STOCK DEFINITION AS A NECESSARY BASIS FOR COOPERATIVE MANAGEMENT OF GREAT LAKES FISH RESOURCES. *Can. J. Fish. Aquatic Sci.* 38(12):1476-1478. Dec. 1981. SFA 27(2)
[U.S. FWS, Great Lakes Fish. Lab., Ann Arbor, MI 48105]

82-001237 Oglesby, R. T. THE MEI SYMPOSIUM--OVERVIEW AND OBSERVATIONS. *Trans. Am. Fish. Soc.* 111(2):171-175. Mar. 1982. SFA 27(2)
[Dep. Nat. Resour., Cornell Univ., Ithaca, NY 14853-0188]

82-001238 Pihu, E. and A. Mäemets. THE MANAGEMENT OF FISHERIES IN LAKE VÕRTSJÄRV. *Hydrobiologia* 86(1-2):207-210. 16 Jan. 1982. SFA 27(2)
[Inst. Zool. Bot., Acad Sci. Estonia S.S.R., Tallinn, USSR] L. Võrtsjärv is a eutrophic lake in Central Estonia. The area of the lake is 270km^2, the average depth only 2.8m. The biological productivity of the lake is rather low. Twelve to fifteen years ago the main fish were ruff and perch (80-90% of catch), while the numbers of valuable fish were small. At the same time the total catch of fish was relatively high--about 300 tons a year. Attempts were made to reduce the numbers of undesirable fish by by intense trawl-catch but no marked results were achieved. Subsequently trawl-catch was ended, elvers were regularly introduced into the lake and

LAKE MANAGEMENT AND RESEARCH (CONTINUED)

82-001238 CONTINUED protection of valuable fish was improved. At the present time the total catch of fish has decreased (184 tons in 1979), but pike-perch and eels are now the main game fish (50-60% of catch) and the value of the catch of fish has risen 2-3 times.

82-001239 Ryder, R. A. THE MORPHOEDAPHIC INDEX--USE, ABUSE, AND FUNDAMENTAL CONCEPTS. *Trans. Am. Fish. Soc.* 111(2):165-170. Mar. 1982. SFA 27(2)
[Mar. Ecol. Lab., Bedford Inst. Oceanogr., P.O. Box 1006, Dartmouth, NS B27 4A2, Canada]

82-001240 Salojärvi, K.; H. Auvinen and E. Ikonen. A PLAN FOR FISHERIES MANAGEMENT IN THE LAKES DRAINED BY THE OULUJOKI RIVER. *Hydrobiologia* 86(1-2):211-217. 16 Jan. 1982. SFA 27(2)
[Finnish Game Fish Res. Inst., Fish. Div., P.O. Box 193, SF-00131 Helsinki 13, Finland] Freshwater fishery management is treated as a dynamic system comprising environment protection and improvement, fishing, fishery resources allocation, fish stocking programs and marketing policy. The aims of the plan are to increase the economic value of the catch and to protect the professional fishery. Fisheries statistics, catch per unit effort data and other material were collected during 1972-1976. The total allowable catch (TAC) for the most important fish species was estimated with MSY and population analysis models. The results of fish stocking were studied by tagging and population analysis calculations. Fishing of vendace and non-valuable species (perch, roach, smelt) can be increased, but the fishing pressure on other species should not be raised above the present level. Restrictions on whitefish fishing are needed in some areas. A balanced multispecies fishery is desirable, and suggestions are given for the composition of the fishing gear. Fish stocking can make possible a larger and more valuable catch, but at present its profitability is rather low. The stocking results are strongly affected by the fishery and the gear composition.

82-001241 Schlesinger, D. A. and H. A. Regier. CLIMATIC AND MORPHOEDAPHIC INDICES OF FISH YIELDS FROM NATURAL LAKES. *Trans. Am. Fish. Soc.* 111(2):141-150. Mar. 1982. SFA 27(2)
[Inst. Environ. Stud., Univ. Toronto, Toronto, ON M5S 1A1, Canada]

82-001242 Toivonen, J.; H. Auvinen and P. Valkeajärvi. FISH STOCK ASSESSMENTS IN LAKE KONNEVESI. *Hydrobiologia* 86(1-2):219-222. 16 Jan. 1982. SFA 27(2)
[Finnish Game Fish. Res. Inst., Fish. Div., P.O. Box 193, SF-00131 Helsinki 13, Finland] In 1977, the average fish yield in the oligotrohic and oligohumic lake Konnevesi was 6.4kg ha^{-1} (2.6 kg vendace, 1.3kg perch, 0.7kg whitefish, 0.5kg roach, 0.3kg pike and 0.3kg burbot). In that year the stock of vendace was exceptionally poor. A study was made to determine the optimum strategy for exploiting the stocks. The field work included test fishing (1970-78), sampling of catches (1977-80) and collection of catch per unit effort data (1978-80), and catch statistics (1969, 1970, 1977). The stocks were assessed by the Beverton and Holt method. Whitefish is exploited at a proper level. Fishing of vendace and roach can be increased, and the yield of pike would be greater, if the recruiting age were higher than at present.

82-001243 Youngs, W. D. and D. G. Heimbuch. ANOTHER CONSIDERATION OF THE MORPHOEDAPHIC INDEX. *Trans. Am. Fish. Soc.* 111(2):151-153. Mar. 1982. SFA 27(2)
[Dep. Nat. Resour., Cornell Univ., Ithaca, NY 14853]

RIVER AND STREAM MANAGEMENT AND RESEARCH

82-001244 Evans, W. A. CAN WE SAVE OUR ANADROMOUS FISH RESOURCES IN SMALL COASTAL STREAMS?--A LOOK AT THE PAST, PRESENT AND FUTURE. *Cal-Neva Wildl. Trans.* p. 148-154. 1981. SFA 27(2)
[U.S. For. Serv., Region 5, San Francisco, CA 94111] The status of anadromous fish resources in small coastal rivers is examined for the periods of 1900-1940, 1940-1980, and 1980-2020 in the Southern, Central and Northern areas of California. Declining trends are perceived in all areas ranging from annihilation in the Southern and San Francisco Bay areas to partial retention in the Northern sector. Principal causes for the decline are briefly covered along with proposed solutions to the present dilemma.

82-001245 Gerstung, E. R. STATUS AND MANAGEMENT OF THE COAST CUTTHROAT TROUT (*SALMO CLARKI CLARKI*) IN CALIFORNIA. *Cal-Neva Wildl. Trans.* p. 25-32. 1981. SFA 27(2)
[Calif. Dep. Fish. Game, Sacramento] Coast cutthroat trout, *Salmo clarki clarki*, are restricted in California to a narrow coastal strip 5 to 20 miles wide extending north from the Eel River Delta. Limited information regarding occurrence and relative abundance has been obtained as a by-product of anadromous fish sampling and habitat surveys. Estimates of sea run escapement, harvests, and angling use do not exist in California. Coast cutthroat trout appear to be declining in abundance as a result of widespread habitat degradation. Coast cutthroat trout in California have been observed in 780 miles of stream and 4 coastal lagoons. The best populations occur in the Smith River system. Sea run populations occur in larger waterways north of the Mad River. Little management effort outside of habitat protection and some limited stocking of hatchery reared fish has been directed toward coast cutthroat trout in this state.

82-001246 Hoyt, R. D. and W. A. Robison. EFFECTS OF IMPOUNDMENT ON THE FISHES IN TWO KENTUCKY TAILWATERS. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:307-317. 1980[1981]. SFA 27(2)
[Dep. Biol., West. Ky. Univ., Bowling Green 42101] The most noticeable differences in the pre- and post-impoundment tailwater fish communities in Green and Barren rivers, Kentucky, were reduced biomass, loss of cyprinid species, increased game-fish numbers, and decreased rough-fish numbers. These differences were attributed to altered post-impoundment environmental conditions in the tailwater (lowered water temperatures and irregular flow patterns), and species recruitment through the dams. Carp, while not present before impoundment in the tailwater reaches, represented a prominent component of the community after damming.

82-001247 Lee, D. P. INSTREAM FLOW REQUIREMENTS FOR DINKEY CREEK, FRESNO COUNTY. *Cal-Neva Wildl. Trans.* p. 1-10. 1981. SFA 27(2)
[Calif. Dep. Fish Game, 1234 E. Shaw Ave., Fresno 93710]

82-001248 McDonald, J. THE STOCK CONCEPT AND ITS APPLICATION TO BRITISH COLUMBIA SALMON FISHERIES. *Can. J. Fish. Aquatic Sci.* 38(12):1657-1664. Dec. 1981. In English with French summ. SFA 27(2)
[Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

82-001249 Minckley, W. L. TROPHIC INTERRELATIONS AMONG INTRODUCED FISHES IN THE LOWER COLORADO RIVER, SOUTHWESTERN UNITED STATES. *Calif. Fish Game* 68(2):78-89. Apr. 1982. SFA 27(2)
[Dep. Zool., Ariz. State Univ., Tempe 85281] Analysis of 1,050 stomachs of 18 species of fishes from the lower Colorado River mainstream indicates a relatively simplified food web based on autochthonous detrital materials,

RIVER AND STREAM MANAGEMENT AND RESEARCH (CONTINUED)

82-001249 CONTINUED algae, and macrophytes. Aquatic insects, clams, and crayfish eaten by larger fishes fed directly on detritus or particles filtered from the water. Threadfin shad and red shiner, both depending principally on detritus as food, were major forage for piscivores.

82-001250 Norris, R. M., Jr. HISTORY & ROLE OF THE POTOMAC RIVER FISHERIES COMMISSION. *Proc. Annu. Meet. Potomac Chap. Am. Fish. Soc.* 5:159-165. 1981(1982). SFA 27(2)

82-001251 Rasin, V. J., Jr. and P. J. Leach. WATER QUALITY AND RECREATIONAL OPPORTUNITIES ALONG THE POTOMAC RIVER IN THE VICINITY OF THE DISTRICT OF COLUMBIA. *Proc. Annu. Meet. Potomac Chap. Am. Fish. Soc.* 5:90-96. 1981(1982). SFA 27(2)
[4205 Warner St., Kinsington, MD 20895]

82-001252 Ricker, W. E. CHANGES IN THE AVERAGE SIZE AND AVERAGE AGE OF PACIFIC SALMON. *Can. J. Fish. Aquatic Sci.* 38(12);1636-1656. Dec. 1981. In English with French summ. SFA 27(2)
[Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

82-001253 Saunders, R. L. ATLANTIC SALMON (*SALMO SALAR*) STOCKS AND MANAGEMENT IMPLICATIONS IN THE CANADIAN ATLANTIC PROVINCES AND NEW ENGLAND, USA. *Can. J. Fish. Aquatic Sci.* 38(12):1612-1625. Dec. 1981. In English with French summ. SFA 27(2)
[Dep. Fish. Oceans, Biol. Stn., St. Andrews, NB E0G 2X0, Canada]

FARM POND AND SMALL IMPOUNDMENT MANAGEMENT AND RESEARCH

82-001254 Farquhar, B. W.; R. L. Noble and C. E. Cichra. FACTORS AFFECTING FISH POPULATIONS IN FLOOD PREVENTION LAKES OF NORTH-CENTRAL TEXAS. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:292-306. 1980[1981]. SFA 27(2)
[Dep. Wildl. Fish. Sci., Tex. A&M Univ., College Station 77843] During summer, 1976, limnological and fish population data were obtained from 56 flood prevention lakes of the Trinity River watershed. Fish samples obtained by gillnetting, electrofishing, and seining indicated that the principal fishes were largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), black bullheads (*Ictalurus melas*), white crappie (*Pomoxis annularis*), green sunfish (*Lepomis cyanellus*), channel catfish (*Ictalarus punctatus*), golden shiner (*Notemigonus crysoleucas*), and redear sunfish (*Lepomis microlophus*). Analysis of fish data was performed by simple and multiple correlation techniques in relation to physical, limnological, and biological variables. Variation in fish biomass, as indicated by gill net catch, was explained by a combination of biological and physical characteristics, whereas species composition was a more important factor in largemouth bass models. Channel catfish characteristics, in contrast, were highly affected by physical and limnological variables. Although models explaining variation in white crappie characteristics were generally imprecise, sunfish models were typically highly significant due to strong influence of physical and limnological factors. These results emphasize the need for management objectives directed toward a single species or group of species in flood prevention lakes.

FARM POND AND SMALL IMPOUNDMENT MANAGEMENT AND RESEARCH (CONTINUED)

82-001255 Hallerman, E. M.; D. P. Philipp and M. Pasdar. USE OF HYBRID SUNFISH IN PONDS OR SMALL IMPOUNDMENTS. *Cal-Neva Wildl. Trans.* p. 33-37. 1981. SFA 27(2)
[Coachella Valley Water Dist., P.O. Box 1058, Coachella, CA 92236] Growth of hybrids of redear and green sunfish, in their first two growing seasons, compared favorably with that of the parental species raised in the same ponds. The redear ♀ X green ♂ hybrid showed somewhat greater weight gain than its reciprocal hybrid, in at least the first year. This accelerated growth suggests the utility of establishing populations of these particular hybrids in situations where they are isolated from the parent species. Work is underway to estimate the likelihood of backcrossing in mixed hybrid and nonhybrid communities.

LARGE IMPOUNDMENT MANAGEMENT AND RESEARCH

82-001256 Combs, D. L. FISH POPULATION CHANGES IN KEYSTONE RESERVOIR FOURTEEN YEARS AFTER STRIPED BASS INTRODUCTIONS. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:167-174. 1980[1981]. SFA 27(2)
[Okla. Dep. Wildl. Conserv., Porter 74454] During the 14 years after initial introduction, a viable striped bass (*Morone saxatilis*) sport fishery development on Keystone Reservoir. Natural reproduction, first identified in 1970, continued through 1979 in tributary rivers. Selected endemic fish species showed no significant changes in standing crop estimates from cove rotenone studies 1971-73, 1976-79. Available prey-predator ratios (AP/P) showed a fluctuating availability of forage for small predators and ample prey for large predators.

82-001257 Hudson, P. L. and W. E. Lorenzen. MANIPULATION OF RESERVOIR DISCHARGE TO ENHANCE TAILWATER FISHERIES. *Symp. Proc. Unified River Management (Am. Water Resour. Assoc.)* p. 568-579. 1980. SFA 27(2)
[U.S. FWS, Southeast Reservoir Invest., 206 Highway 123 By-Pass, Clemson, SC 29631] Depths at which water is withdrawn from reservoirs, and associated water release patterns, are among the most important determinants of reservoir river biology. Although past concerns have been for the fishery in either the upstream reservoir or downstream tailwater, contemporary systems management requires a unified approach encompassing the entire river basin. Losses of fish, plankton, insects, and nutrients through reservoir discharges are usually thought of as a reservoir loss rather than as a tailwater or downstream gain. Research by the U.S. Fish and Wildlife Service has indicated that the distribution and movement patterns of many organisms in reservoirs are predictable. The predictability of the distribution of organisms near any water intake structure is a valuable management tool because it can be used to either reduce entrainment or facilitate the transport of organisms from reservoir to tailwater. Manipulation of water flow by multilevel intakes may not be feasible in a given year on all reservoirs in a basin but may be possible over a period of years.

82-001258 Jenkins, R. M. THE MORPHOEDAPHIC INDEX AND RESERVOIR FISH PRODUCTION. *Trans. Am. Fish. Soc.* 111(2):133-140. Mar. 1982. SFA 27(2)
[U.S. FWS, Natl. Reservoir Res. Proj., 100 W. Rock St., Fayetteville, AR 72701]

82-001259 Kohler, C. C. and J. J. Nagy. SUITABILITY OF ALEWIFE AS A PELAGIC FORAGE FISH FOR SOUTHEASTERN RESERVOIRS. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:137-150. 1980[1981]. SFA 27(2)
[Fish. Res. Lab., South Ill. Univ., Carbondale 62901] Alewife (*Alosa pseudoharengus*) were evaluated as a pelagic forage fish for southeastern reservoirs based on results of trophic and population ecology studies

LARGE IMPOUNDMENT MANAGEMENT AND RESEARCH (CONTINUED)

82-001259 CONTINUED conducted in Claytor Lake, Virginia. Positive attributes of the alewife forage based included: a) establishment of a profilic and self-sustaining population, b) high desirability and availability to pelagic predators, and c) a positive impact on growth of pelagic sportfish. Negative attributes included: a) predation on larval fish, b) low desirability and/or availability to littoral sportfishes, c) rapid growth beyond a size vulnerable to most predators, d) fluctuating population levels, e) alteration of zooplankton size composition by selective predation on largest forms, and f) emigration to a downstream reservoir. Alewife are most suitable for introduction to waters managed primarily for pelagic piscivores on a put-grow-take basis. Because of the potential for emigration, management decisions regarding alewife should be developed on a regional rather than local basis.

82-001260 Wright, G. L. and G. W. Wigtil. COMPARISON OF GROWTH, SURVIVAL, AND CATCHABILITY OF FLORIDA, NORTHERN, AND HYBRID LARGEMOUTH BASS IN A NEW OKLAHOMA RESERVOIR. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:31-38. 1980[1981]. SFA 27(2)
[Okla. Dep. Wildl. Conserv., Rt. 3, Box 45, Holdenville 74848] Florida largemouth bass, *Micropterus salmoides floridanus*, northern largemouth bass, *M. s. salmoides*, and their F^1 hybrid were stocked in a new 420 ha reservoir, and their growth, relative survival and relative catchability were compared. The Florida and hybrid bass were found to achieve the best overall growth by the end of the study period. However, of the 3 strains, Florida bass appeared to have the greatest potential for growth. Hybrid bass suffered less relative mortality than Florida bass, which suffered less than northern bass. Differences in relative catchability were not observed among the three strains of bass.

ESTUARY MANAGEMENT AND RESEARCH

82-001261 Barry, J. P. and G. M. Cailliet. THE UTILIZATION OF SHALLOW MARSH HABITATS BY COMMERCIALLY IMPORTANT FISHES IN ELKHORN SLOUGH, CALIFORNIA. *Cal-Neva Wildl. Trans.* p. 38-47. 1981. SFA 27(2)
[Moss Landing Mar. Lab., Moss Landing, CA 95039]

82-001262 Kapetsky, J. M. SOME CONSIDERATIONS FOR THE MANAGEMENT OF COASTAL LAGOON AND ESTUARINE FISHERIES. *FAO Fish. Tech. Pap.* No. 218. vii + 47p. 1981. SFA 27(2)
[Fish. Resour. Environ. Div., FAO of the UN, Rome, Italy]

82-001263 Richkus, W. A. and J. K. Summers. HISTORICAL ANALYSIS OF THE POTOMAC ESTUARY WHITE PERCH FISHERY. *Proc. Annu. Meet. Potomac Chap. Am. Fish. Soc.* 5:97-114. 1981(1982). SFA 27(2)
[Environ. Cent., Martin Marietta Corp., 1450 South Rolling Rd., Baltimore, MD 21227] White perch are one of the major sport and commerical species landed in the Potomac estuary. Average annual commercial landings between 1964 and 1971 were on the order of 200,000 lbs. The fishery shifts from mid-estuary in the spring to lower estuary in the summer and fall. Differing jurisdiction over tributaries and main stem complicates analysis of the fishery. Annual production of juveniles appears related to magnitude of landings in the main stem. Growth rates may be lower than in comparable water bodies. Regression analysis using a juvenile index as a predictor suggests that the main stem catch may consist primarily of 8 to 10 year old perch, possibly due to gill net selectivity. A surplus production model suggested that annual maximum equilibrium yield is 175,000 lbs.; however, model assumptions do not appear to be rigorously met.

ESTUARY MANAGEMENT AND RESEARCH (CONTINUED)

82-001264 Unesco. COASTAL LAGOON RESEARCH, PRESENT AND FUTURE. *Unesco Tech. Pap. Mar. Sci.* 33. 348p. 1981. SFA 27(2)
[7, place de Fontenay, 75700 Paris, France]

MARINE MANAGEMENT AND RESEARCH

82-001265 DeVries, D. A. DESCRIPTION AND CATCH COMPOSITION OF NORTH CAROLINA'S LONG HAUL SEINE FISHERY. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:234-247. 1980[1981]. SFA 27(2)
[N.C. Dep. Nat. Resour. Community Dev., Div. Mar. Fish., Morehead City 28557]

82-001266 FAO of the UN. REPORT OF THE SIXTH SESSION OF THE FISHERY COMMITTEE FOR THE EASTERN CENTRAL ATLANTIC (CECAF). *FAO Fish. Rep.* No. 229. iii + 67p. 1980. SFA 27(2)
[Rome, Italy]

82-001267 International Council for the Exploration of the Sea. REPORTS ON DIALOGUE MEETINGS, 20-21 MAY AND 4 OCTOBER 1980. *Int. Counc. Explor. Sea Coop. Res. Rep.* No. 106. 69p. Apr. 1981. SFA 27(2)
[Palægade 2-4, 1261 Copenhagen K, Denmark]

82-001268 Pacific Fishery Management Council. PACIFIC COAST GROUNDFISH FISHERY MANAGEMENT PLAN. *Pac. Fish. Manage. Counc., Portland, Oreg.* 21 Jan. 1982. SFA 27(2)
[526 S.W. Mill St., Portland, OR 97201]

82-001269 Rivas, L. R. and D. B. McClellan. SHARK INVESTIGATIONS BY THE NATIONAL MARINE FISHERIES SERVICE, MIAMI LABORATORY. *Fla. Sci.* 45(1):40-45. 1982. SFA 27(2)
[NMFS, 75 Virginia Beach Dr., Miami, FL 33149]

82-001270 Stevenson, D. K. and F. Carranza. MAXIMUM YIELD ESTIMATES FOR THE PACIFIC THREAD HERRING, *OPISTHONEMA* SPP., FISHERY IN COSTA RICA. *NOAA Fish. Bull.* 79(4):689-703. Oct. 1981. SFA 27(2)
[Dep. Zool., Univ. Me., Orono 04469]

82-001271 Yamaguchi, Y. and K. Murabayashi. [THE FISH-LURING EFFECT OF FLOTSAM.] *Bull. Jpn. Soc. Sci. Fish.* 47(10):1295-1298. Oct. 1981. In Japanese with English summ. SFA 27(2)
[Fac. Fish., Mie Univ., Edobashi, Tsu 154, Japan] A research was made into the fish-luring effect of flotsam using the fishing records of the purseseine boat operating on the sea near New Guinea. The results obtained may be summarized as follows: 1) T-test shows that a moderately-aged flotsam with fouling animals has the best luring effect, a rotted one comes next, and a fresh one has the worst luring effect. 2) The fish-luring effect of flotsam drifting alone is better than that of assembled flotsam in current-boundary. 3) Flotsam with small bait fish or sea birds has a better luring effect than one without them. 4) It is estimated that a moderately-aged flotsam with fouling animals will lure 0.5~18.3 tons of fish per day.

MISC. TECHNIQUES AND EQUIPMENT

82-001272 Boyd, C. E. COMPARISONS OF WATER ANALYSIS KITS. *Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies* 34:39-48. 1980[1981]. SFA 27(2)
[Dep. Fish. Allied Aquacult., Auburn Univ., Auburn, AL 36830]

82-001273 Prewitt, C. G. and C. A. Carlson. EVALUATION OF FOUR INSTREAM FLOW METHODOLOGIES USED ON THE YAMPA AND WHITE RIVERS, COLORADO. *U.S. Bur. Land Manage. (Denver, Colo.) Biol. Sci. Ser.* No. 2. iv + 65p. 1980. SFA 27(2)
[Dep. Fish. Biol., Colo. State Univ., Fort Collins 80521] Four stream flow assessment methodologies were applied to selected reaches of the middle Yampa and White Rivers in Colorado. These were 1) The Tennant method, 2) R-2 Cross, 3) WSP, and 4) the incremental analysis method developed by the Cooperative Instream Flow Service Group (IFG) of the U.S. Fish and Wildlife Service in Fort Collins, Colorado. The methodologies were applied in accordance with standard published procedures or criteria supplemented by various agencies. The flow recommendations were evaluated against actual field observations of physical and biotic conditions in both rivers and against weighted usable area predictions from the IFG incremental model. Flow requests from the Tennant method (30 percent of mean annual flow) were acceptable for the White River but unnecessarily high for the Yampa River. R-2 Cross flow requests varied considerably depending upon cross sectional placement but the "best" request was considered adequate for both rivers. WSP requests approximated those of R-2 Cross and were also considered adequate. The flow level derived from the first three methodologies (200 cubic feet per second (cfs) was analyzed in a two species contrast with the IFG methodology and found to provide critically low habitat for Colorado squawfish while offering near optimum conditions for channel catfish. Minimum flows in such rivers should be evaluated on a flow regime rather than a long-term minimum flow basis. Cost and time evaluations were also conducted. The various field procedures required approximately equal cost and time inputs, but the IFG incremental analysis offered the greatest analytic advantages.

82-001274 Williamson, N. J. CLUSTER SAMPLING ESTIMATION OF THE VARIANCE OF ABUNDANCE ESTIMATES DERIVED FROM QUANTITATIVE ECHO SOUNDER SURVEYS. *Can. J. Fish. Aquatic Sci.* 39(1):229-231. Jan. 1982. In English with French summ. SFA 27(2)
[NMFS, Northwest Fish. Cent., Seattle, WA 98112]

REVIEWS, BIBLIOGRAPHIES, ETC.

82-001275 Darracott, D. A. and A. C. Brown. BIBLIOGRAPHY OF MARINE BIOLOGY IN SOUTH AFRICA. *S. Afr. Natl. Sci. Prog. Rep.* No. 41. vii + 239p. Feb. 1980. Available from Publ. Div., CSIR, P.O. Box 395, Pretoria 0001, South Africa. SFA 27(2)

82-001276 FAO of the UN. WORLD LIST OF AQUATIC SCIENCES AND FISHERIES SERIAL TITLES. *FAO Fish. Tech. Pap.* No. 147(suppl. 4). x + 120p. Feb. 1980. SFA 27(2)
[Rome, Italy]

REVIEWS, BIBLIOGRAPHIES, ETC. (CONTINUED)

82-001277 Scarlett, P. G. ANNOTATED BIBLIOGRAPHY AND SUBJECT INDEX ON THE SUMMER FLOUNDER, *PARALICHTHYS DENTATUS*. *NOAA Tech. Rep. NMFS SSRF* 755. iii + 12p. Mar. 1982. SFA 27(2)
[Nacote Creek Mar. Fish. Lab., N.J. Div. Fish Game Wildl., Star Route, Absecon 08201]

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